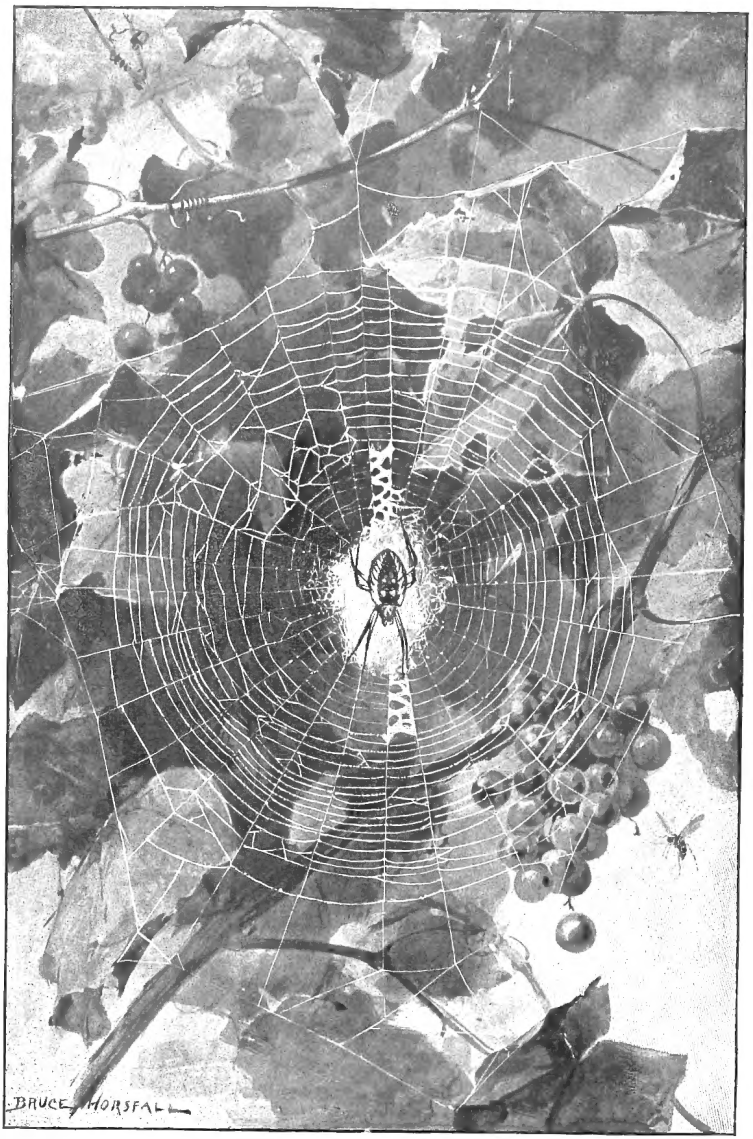
THE SPINNER FAMILY

ALICE JEAN PATTERSON

U. P. JAMES
BOOKSELLER
127 West 7th St.
CINCINNATI, O.

THE SPINNER FAMILY


BRUCE HORSFALL

QL-P317

THE SPINNER FAMILY

BY

ALICE JEAN PATTERSON

With Frontispiece in color, and many Drawings in the text, by

BRUCE HORSFALL

CHICAGO
A. C. McCLURG & CO.
1916

COPYRIGHT
A. C. McCLURG & Co.
1903

Published September 12, 1903

PREFATORY NOTE

THIS little book does not pretend to be a scientific work in the strictest sense. It claims to be a simple, accurate account of the habits and characteristics of many of our common spiders. With a few exceptions, — chiefly the habits of the trapdoor, turret, and water spiders, — the book has been prepared from notes gathered from my own observation and study during a period of several years.

All of Nature's children are interesting, whether rock or stream, herb or tree, bird or insect or other animal, and the spiders are by no means the least interesting among them all. Nowhere will the student and lover of nature find a more profitable study or a keener joy than in delving into the secrets of the spinners, or watching them solve the

problems which they meet in their struggle for existence.

At the same time, no other field of nature study is more accessible, for there is no locality where the spiders may not be found. Streams and woods, meadows, fields, and gardens all furnish dwelling-places for them; and here the busy little creatures hide their secrets which

> "They will surrender to the patient eye
> That seeks and waits."

If I have any purpose in writing this little book, other than the pleasure that comes from gathering scattered material into a whole, it is that some of my readers may be led to make the acquaintance of the spiders in their homes, in order to know and to enjoy their interesting ways and habits.

A. J. P.

NORMAL, ILL., August 1, 1903.

CONTENTS

		Page
I	An Introduction to Mrs. Epeira . .	15
II	Mrs. Epeira's Mouth and All that goes with it	22
III	How She finds out Things in the World	28
IV	Mrs. Epeira's Spinning Machine . . .	32
V	The Building of her House	37
VI	More about Mrs. Epeira's House and its Use	46
VII	Some of Mrs. Epeira's Neighbors . .	53
VIII	More Neighbors, the Hunchbacks and Mimics	61
IX	The Tent-Makers	68
X	Mrs. House-Spider	76
XI	The Silk Combers	82
XII	The Jumpers	86
XIII	The Fliers	92
XIV	Spinners who live in the Ground . .	99
XV	The Baby Spinners	108

Contents

		Page
XVI	Baby Spinners, continued	114
XVII	The Gentlemen of the Family . . .	124
XVIII	How the Spinners spend the Winter .	130
XIX	The Spinners' Enemies, and how they defend themselves	136
XX	Growing, Breathing, and other Things	145
XXI	Queer Things	154

ILLUSTRATIONS

Frontispiece

PAGE

The under side of the cephalo-thorax, showing attachment of legs 17
Mrs. Epeira's leg 18
Mrs. Epeira's foot 18
"She performs all sorts of athletic feats" 19
Male palp 23
Maxilla with palp 24
Diagram showing the poison-gland with the tube leading to the tip of the poison-fang 26
Mrs. Epeira's eyes 29
The six spinnerets 33
Framework and spokes of Mrs. Epeira's house . . . 37
"She glides along the frail, swaying thread" 40
Mrs. Epeira's house with the foundation and the spiral scaffolding 43
Mrs. Epeira's finished house 45
"It looks like a string of tiny beads" 46
Two spokes of a web with the inelastic threads . . . 47
The inelastic threads replaced by sticky threads . . . 47
"There, it has touched the wheel" 48
"It has become a little white mummy" 49
"It is a unique little room, shaped like a bell" . . . 52

Illustrations

PAGE

"Head downward, to await callers" 56
Miss Silverback 58
Diagram of Silverback's eyes 59
"But where is she?" 62
"As a sailor would climb a mast" 64
"The owner of this exquisite home" 65
"Her disguise is complete" 66
"Mrs. Hunchback" 67
The tent-makers 69
"Peeping out upon the roof" 72
"Mrs. Grass Spider" 73
"Mrs. Spinner has darted from her stairway" . . . 75
"Like a ball as she hangs from her web" 78
"The beetle is hoisted to the desired position" . . . 80
Cribellum and spinnerets of the Silk-Comber . . . 84
Leg of the Silk-Comber 85
Diagram of Mrs. Attidæ's eyes 87
"In the most threatening manner" 89
"She is holding fast with four pairs of feet" . . . 96
"She stands on tiptoe" 97
"All the home that our common black running spider possesses" 100
"Capture their prey by main force" 101
"You see what a beauty she is" 102
The turret 103
"Sometimes the lady of the house fastens her door open by means of threads" 105
"Now and then one sets up its housekeeping in a bunch of bananas" 107
The house Mrs. Jumping-Spider has for her children . 109

Illustrations

PAGE

"Even now they wander only an inch or two away from the open door" 113

"Vibrating back and forth like a pendulum" . . . 116

"Triumphantly hung the tan-colored cradle" . . . 119

"Often only a small number is left to sail away in the spring" 121

"Our common black runner does not trust her eggs in any cosy nook or corner" 122

"Rushes at him with open jaws 127

"Some birds are enemies of the spinners" 137

"Then she carries it off" 139

"Larvæ which begin industrially to devour the eggs of the spider" 140

"Dainty cast-off specks of dresses" 146

"And hangs there like a wet rag" 148

"Always prowling about at night" 154

"If a spider drops by a thread from the ceiling" . . 155

THE SPINNER FAMILY

THE
SPINNER FAMILY

I

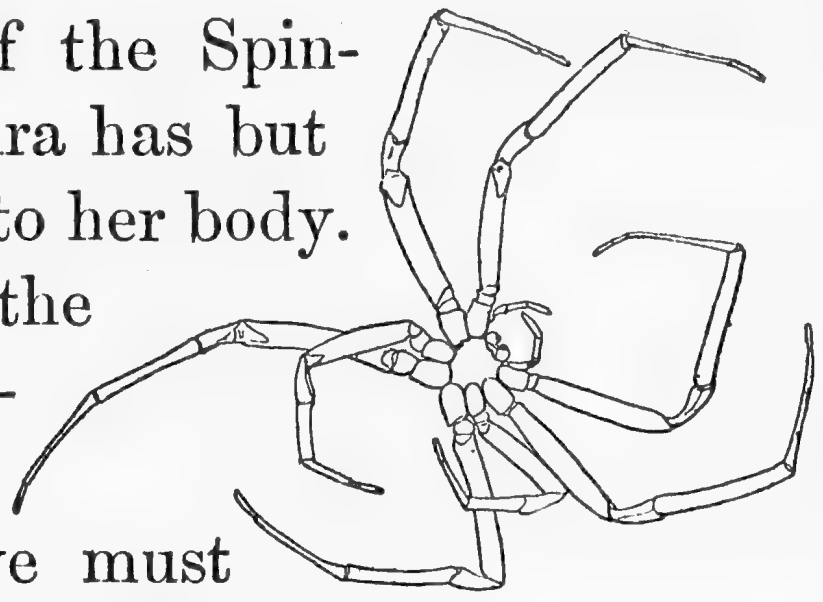
AN INTRODUCTION TO MRS. EPEIRA

THE Spinners are neighbors of ours. They set up their housekeeping in our yards and gardens, in our barns and cellars, and sometimes in the best rooms of our houses. They are skilful little architects and builders, but they are so quiet and even wary about their work that few people ever succeed in catching them at it.

We must visit them in their homes to find out what they do and how they do it.

Here is Mrs. Ĕpe-ī′-ra Vulgaris, who lives in the garden. She is often called the garden spider, but I suppose she has no more right to the name than a dozen other Spinners who live in the same place. She builds her house in open spaces among the vines of the grape arbor, or the branches of trees; sometimes she swings it far above your head among the leaves of the woodbine which cover the back porch.

She is a shy little body, and cares nothing whatever about making your acquaintance. Indeed, she prefers to keep out of your sight, so she tucks herself away in her private chamber and stays there all day long, coming out to her living-room among the vines only after sunset. But even the twilight shows us that she is a very pretty little lady, dressed in a dainty pink gown with brown and white trimmings.



The under side of the cephalo-thorax, showing attachment of legs

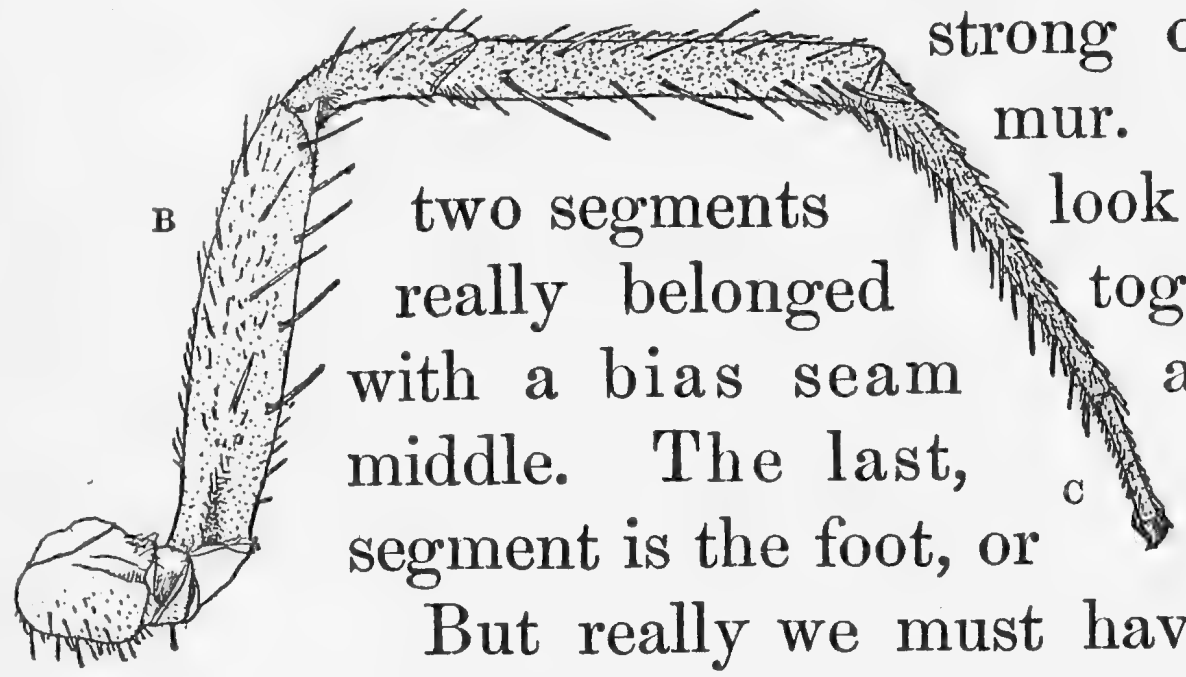
Like all the rest of the Spinner family, Mrs. Epeira has but two distinct divisions to her body. The foremost part is the head and chest combined. If we wish to be very exact, we must call this the cephalo-thorax. The hinder portion is the abdomen. This is almost five times as large as the cephalo-thorax.

Small as the front division is, all of Mrs. Epeira's legs are attached to it, and that means no small thing, for she has no less than four pairs. No wonder she can glide down her rope ladder so fearlessly when she has eight feet and legs with which to hold on!

Every leg is made up of seven pieces or segments. The first round segment, called the coxa, attaches the leg by means of a firm membrane to the under side of the body. The coxas of the

eight legs form an oval surrounding the sternum or breast of Mrs. Epeira.

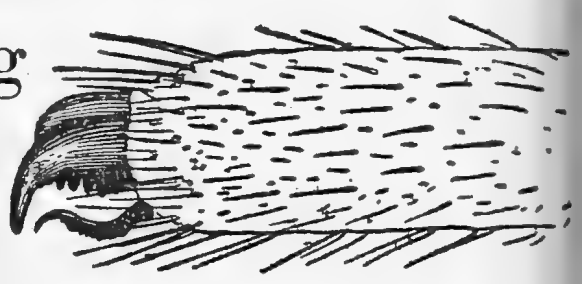
Next to the coxa comes another small, roundish segment, then a long, strong one, the femur. The next two segments look as if they really belonged together as one, with a bias seam across the middle. The last, pointed segment is the foot, or tarsus.



Mrs. Epeira's leg

A, *the coxa;* B, *the femur;* C, *the foot or tarsus*

But really we must have a peep at this many-jointed leg under the microscope before we can see all of the interesting things that it has to show us. There it is, clothed from coxa to toe with hairs, all extending downward toward the foot. Some of them are fine and soft as silk, while others are stiff and bristling like small dark thorns.



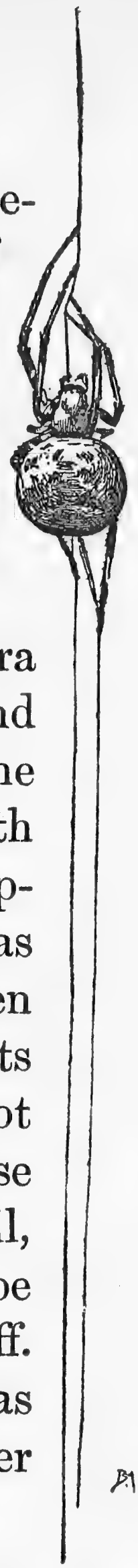
Mrs. Epeira's foot, showing claws

At the end of the foot you see three hooked claws,

as sharp as those of your cat. Besides these, there are a number of small ones so fine and sharp that they make you think of a bunch of tiny needles. These are called spines. Surrounding both claws and spines is a covering of long, stiff hairs.

You are wondering what Mrs. Epeira does with her eight feet and legs and her twenty-four sharp claws. In the first place she runs very rapidly; with four pairs of legs to carry her I suppose she ought to run four times as fast as you do with one pair. Then she performs all sorts of athletic feats that she never could do if it were not for her numerous hooked claws. These help her to climb up a vertical wall, or to run along one of her tight-rope walks,without any fear of tumbling off.

Then, too, she never could cling as she does to the filmy lace hub of her



"She performs all sorts of athletic feats"

house if it were not for these dainty hooks. And above all, she never could build her wonderful house of silk without the aid of these same tools, which serve so many purposes.

She uses her feet to help to hold her food up to her mouth while she eats her dinner, for you know she has no fingers with which to hold it.

Her first pair of legs serve as feelers, just as the antennæ of a grasshopper or a butterfly do. She waves them about to discover whether or not any danger lies in her way.

How would you like to carry a clothes-brush around with you every minute? That is what Mrs. Epeira does. She is a very neat little lady, and if you watch carefully you will see her brushing the dust from her pink gown, and even from her face and eyes, with the soft brushes of hair that she carries on her legs.

There are some other ways in which these interesting feet and legs are made to serve their owner. You notice that they are pretty long for such a small body. When you visit the Lady Spinner in her home you will see that the length of the legs makes it easy for her to spread out her weight over a large space, so she runs no risk of breaking down the delicate walls of her house.

Then, too, there are times when Mrs. Epeira must walk with part of her legs, hold the thread that she cuts with another part, and help to weave with another, all at the same time. So you see she finds enough to do to keep even eight feet and legs busy.

II

MRS. EPEIRA'S MOUTH AND ALL THAT GOES WITH IT

AS we look again at Mrs. Epeira she seems to have another pair of legs, a short pair in front of all the others. Have we made a mistake after all, Mrs. Epeira, and have you ten legs instead of eight?

She only wriggles around and shakes her house a little, as much as to say, "Find out for yourself if you can, for I will not tell you."

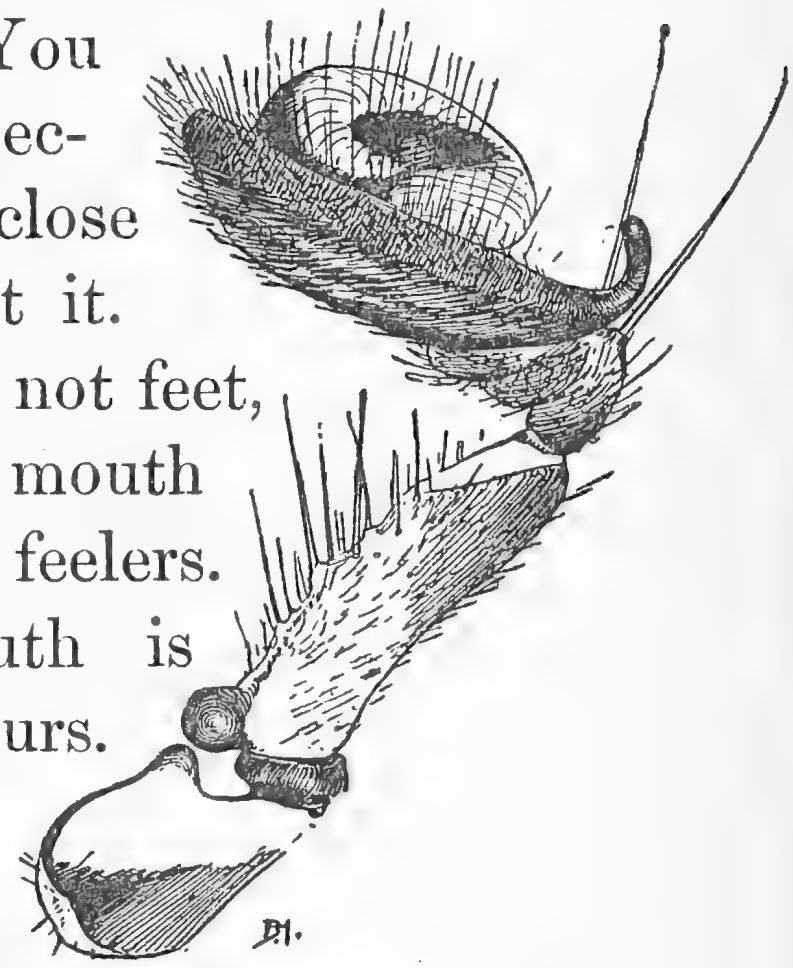
That is just what we expect to do, Mrs. Spinner. If those short appendages are not legs, we shall find out what they are and what they are good for.

There, she has skipped across the entire length of her dining-room, and I

am sure she does not use them to run with. Now she has caught a dusty little miller for her supper. Oh, Mrs. Epeira, your secret is out! You are using those foot-like projections to hold the little insect close to your mouth while you eat it.

So these appendages are not feet, but belong to Mrs. Epeira's mouth parts and are called palps, or feelers.

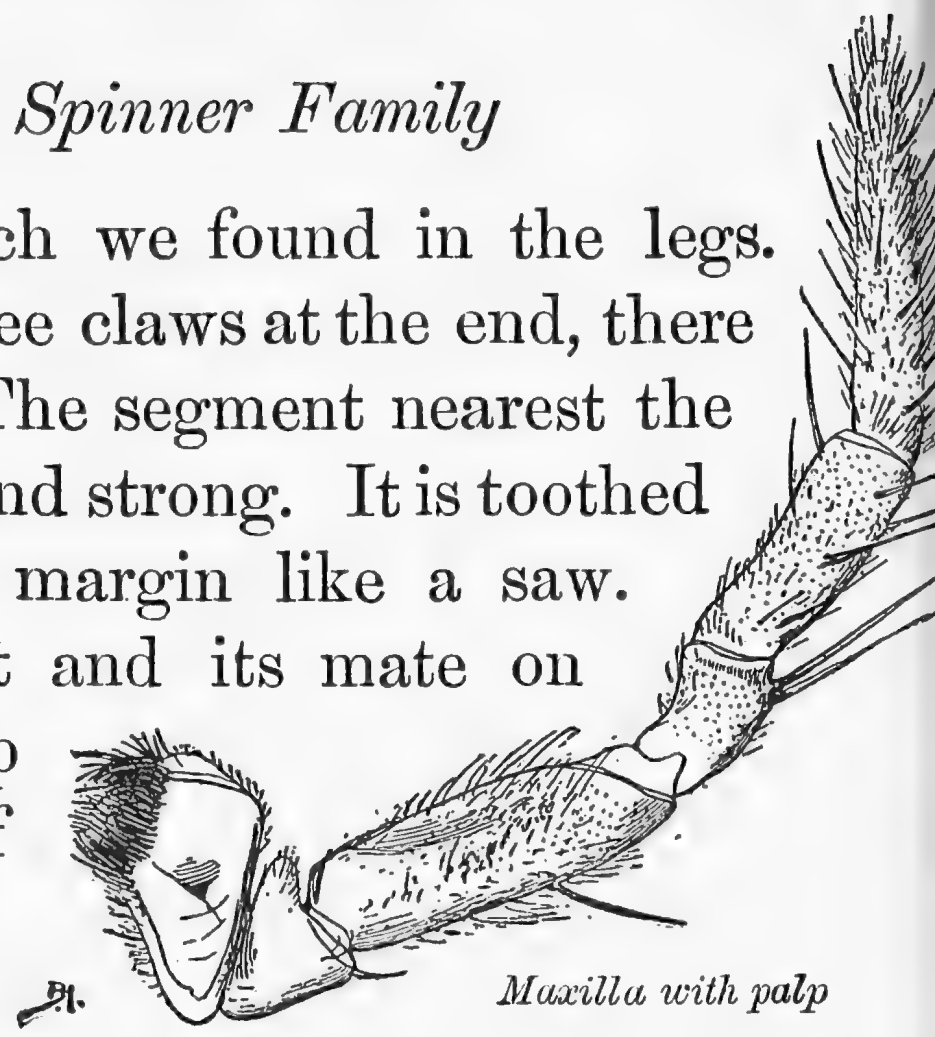
This Lady Spinner's mouth is very, very different from yours. Instead of having teeth and tongue on the inside, as you have, her teeth, and tongue too, are outside of her mouth, so all of her food must be chewed before it goes inside. This being true, she could never get along without her palps to hold the food in just the right place while she is chewing it.



Male palp

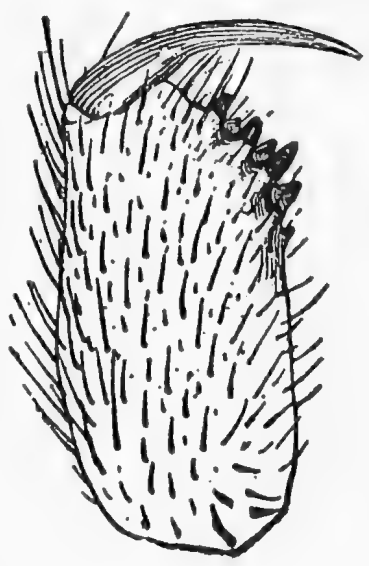
Each palp is made up of six segments instead of seven — the number, you re-

member, which we found in the legs. Instead of three claws at the end, there is but one. The segment nearest the body is flat and strong. It is toothed on its inner margin like a saw. This segment and its mate on the other palp form a pair of small jaws called maxillae. These jaws move back and forth like a pair of scissors, crushing the food.



Maxilla with palp

You would think that one pair of jaws was enough for Mrs. Epeira, but it is not. She has another pair, much larger and stronger than the maxillae. These are the mandibles, or true jaws. Look her straight in the face, and you see the mandibles, like a pair of cylinders, fastened to the front of her head. These are furnished on the



inner margins with the same kind of saw-teeth that you saw on the maxillae.

But this is not all. At the tip of each mandible, Mrs. Epeira carries her weapons. For you must know that all the Spinners make their living in the old-fashioned way, by hunting or trapping. That being the case, they must carry about with them some sort of weapons with which to kill their prey. The weapons are strong spears, sharp enough to pierce through the skin of any insect the Spinner may capture.

I am afraid you will think Mrs. Epeira is a dreadful little savage, for she poisons her spear before she strikes with it. At the tip of each spear is a tiny opening, so small that you cannot see it without the aid of a microscope, and yet it is large enough to allow a jet of poisonous liquid to pass into the wound made by the sharp point. In

this way the immediate death of the prey is insured. The liquid is secreted in a small bag, or gland, which is concealed in the upper part of the mandible. A tiny duct carries the liquid from the gland to the tip of the poison-fang.

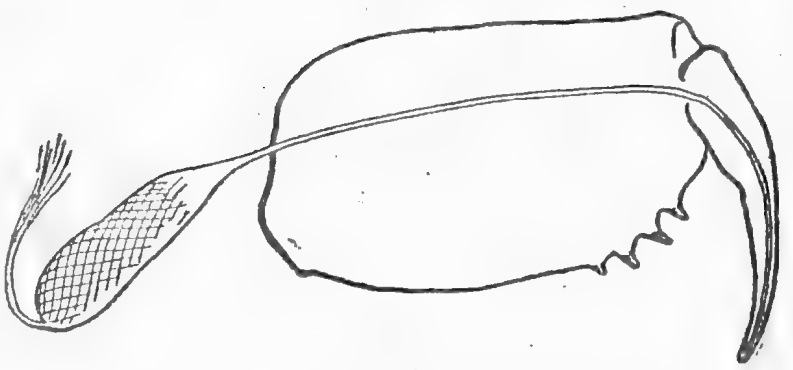


Diagram showing the poison-gland with the tube leading to the tip of the poison-fang

Mrs. Epeira never uses her sharp weapons just for the fun of killing things. She uses them when she is hungry, to kill insects for her food, or to defend herself against the attack of an enemy.

If you were to catch her in your hands, she might try to punish you by piercing your finger with her poisonous weapon. And I am sure no one would blame her if she did. However, if that should happen, you need not be alarmed, for although the poison makes

quick work of killing flies and other insects, it will have but little effect on you. It may make your finger smart or burn for a short time, in much the same way that the sting of a wasp or a bee would serve you.

But remember this, that in spite of all the bad stories you may have heard about Spinners trying to bite people, no Spinner will ever use her poison-fang on you if you do not first attack her and compel her to bite you in self-defence.

When Mrs. Epeira has captured her prey, she sets about chewing it up with all those pointed teeth on her mandibles and maxillae. She chews for hours at a time. There is good reason for this, for no Spinner ever eats any solid food; everything must be reduced to the liquid state before it is sucked into the mouth with the thin lips.

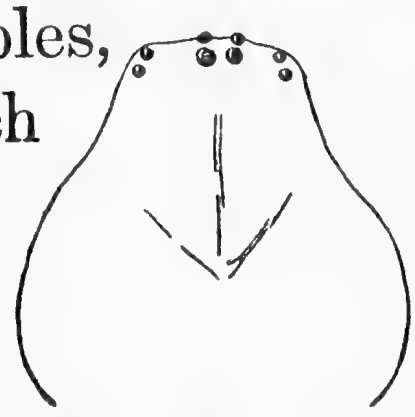
III

HOW SHE FINDS OUT THINGS IN THE WORLD

WHEN you remember Mrs. Epeira's eight feet, her four jaws, and her numerous claws, you will not be surprised to learn that this extravagant little lady possesses no less than eight eyes.

Eight eyes ought to enable one to see very well indeed, but the truth is that all Mrs. Epeira's eyes are not of so much service to her as your two are to you. They are so small that at first glance you are inclined to believe she has no eyes at all. A closer look reveals the dainty jewels set tastefully in the front part of her cephalo-thorax.

They are arranged as you see in the diagram, two on the top of her head, two in front just above the mandibles, and two very close together at each outer corner of the cephalo-thorax.



Mrs. Epeira's eyes

It is a good thing for Mrs. Epeira that her eyes are scattered about so that she can see in every direction, for you know she can never turn her head around to see what is going on behind her.

These tiny eyes are of the kind called simple eyes. They cannot see long distances, as the wonderful compound eyes of the flies and other insects can. They are near-sighted; that is, they can see only those objects that are within a few inches, or at best a foot of Mrs. Epeira's body. They never give her the image of an entire object at one time. When you come near the little Spinner, she sees but a small portion of you, yet that is enough

often to frighten her away. What would she do if she could see what a great giant you really are?

After all, eight eyes are not too many when they are very small, simple ones.

But Mrs. Epeira and all her kindred have other ways of finding out things in the world. They can hear as well as see. Just how they manage to hear without ears is not so easy to understand. However, those who have made a careful study of the Spinners believe that some of the fine hairs on the palps act as hearing organs. Other hairs serve as the organs of smell.

Although Mrs. Epeira can see, and hear, and smell, she does not depend on any of these senses half so much as she does on her sense of touch. Most of the hairs on her legs, and those scattered over her body, are sensitive hairs, so sensitive that she knows in-

stantly the moment you touch any part of her silken house.

It is this wonderful sense that tells her not only that an insect has entered her home, but the exact spot where it is to be found.

Indeed Mrs. Epeira's sense of touch is as good as a hundred eyes, for it enables her to work just as well in the darkness as in the light. And that means a great deal to her, for she does almost all her building under cover of the night.

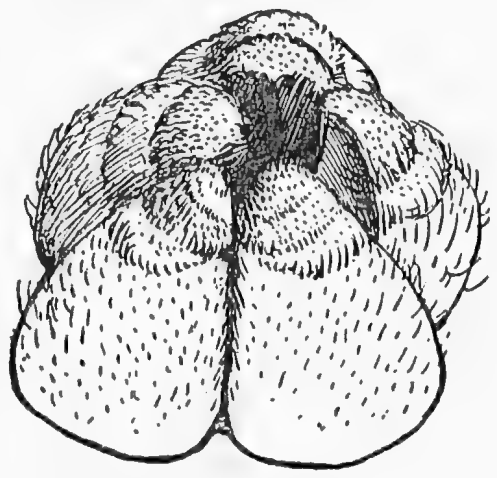
IV

MRS. EPEIRA'S SPINNING-MACHINE

THE appendages we have found thus far, legs and palps, jaws and eyes, have all been fastened to Mrs. Epeira's cephalo-thorax. But attached to her abdomen is the most wonderful of all this little Spinner's possessions, that is, her spinning-machine.

The abdomen itself is large and round, and is fastened to the cephalo-thorax by a small stalk. On its upper surface are a number of queer little markings that look as if some one had tacked the skin fast to something on the inside. And really that is about

what has happened, for these dents are the spots where the ends of the muscles on the inside are fastened to the walls of the body.



The six spinnerets

The spinning-machine is found near the end of the abdomen on the under side. It is composed of six blunt projections that resemble finger-tips. These are called spinnerets, or sometimes spinners. Every spinneret is pierced at the end with hundreds of tiny, tube-like openings. It is through these tubes that the delicate silk for Mrs. Epeira's weaving is drawn out.

On the inside of the abdomen, just above the spinnerets, is a bunch of little pouches or sacs. From each pouch a small duct leads to one of the tube-like openings on the spinnerets. These pouches are glands that secrete a clear,

watery liquid. This means that a portion of the food eaten by Mrs. Epeira is digested or changed into a peculiar fluid which is stored away in these tiny pouches.

When this little lady is in need of some silk, she gently presses her spinnerets against an object and forces a small amount of the fluid through the tube openings. This adheres to the object and then she moves her spinnerets in just the right way to draw the liquid from the tubes. The instant the liquid meets the air it is hardened into a thread.

If you have ever examined an ordinary sewing-thread you know that it is made up of a great many small strands twisted together. That is why it is so strong. Mrs. Epeira knows well enough that one of the delicate threads drawn from a single tube is too slight to be of any use to her, so

she dexterously holds the fingers of her spinning machine close together, and in just the right position, so that the hundreds of dainty strands are united into one firm thread, strong enough to support Mrs. Epeira's own body.

A strange thing about the spinnerets is that they do not all contain the same kind of silk; therefore Mrs. Spinner rarely uses them all at the same time. When she wishes to use one sort of silk she spins with one set of the finger-tips. When she decides that she needs another kind she skilfully changes to another set, and goes on with her work with scarcely a pause. She never makes a mistake, never uses the wrong kind, and never mixes up the different sorts.

Years and years ago, your grandmother and great-grandmother stood by their spinning-wheels and spun woollen and cotton threads. As they

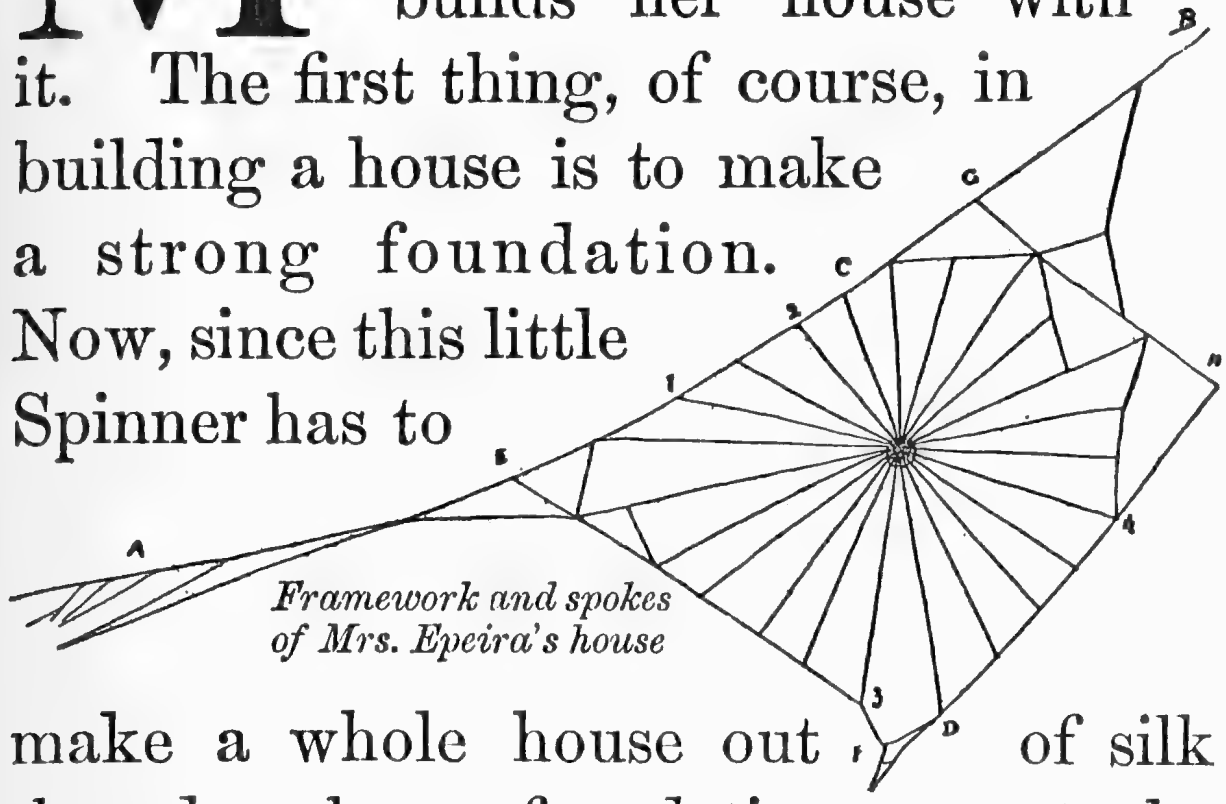
spun they deftly drew out with their hands the long threads, so there would be no danger of breaking or tangling. Now Mrs. Epeira has no hands with which to draw out her threads, but she has something just as good. The claws on her feet take the place of fingers. With these dainty tools she ingeniously guides her thread, carrying it out to one side, keeping it from adhering to surrounding objects, and fastening it where she wishes it to be. Sometimes she uses her claws to draw the threads from the spinnerets.

Now and then the skilful little Spinner wishes to use a band of silk instead of a strong thread. When that is the case she holds her spinnerets apart so that the hundreds of threads unite side by side instead of twisting together, and the band is made.

V

THE BUILDING OF HER HOUSE

MRS. EPEIRA puts her silk to a very queer use: she builds her house with it. The first thing, of course, in building a house is to make a strong foundation. Now, since this little Spinner has to



Framework and spokes of Mrs. Epeira's house

make a whole house out of silk threads, her foundation must be very different from the kind you would make for your house. It consists of an irregular frame-work something like

that you see in the picture. These threads are securely fastened to leaves, twigs, or other objects near enough to be of service.

How do you suppose Mrs. Epeira manages to carry her thread from one support to another? She cannot jump across, for the distance is too great, and she has no wings with which to fly. While you and I have been puzzling ourselves over it, she has set to work, for she knows exactly what to do. She takes for her starting-point that low twig which she has already covered with a network of threads. Now she clings to some of the threads, her back down, her spinnerets upward and extending outward from her body as far as possible. For a moment she keeps perfectly quiet, waiting for something very important to happen. A slight breeze gently stirs the threads. Ah, that is what she is waiting for.

See! she is sending out a stream of silk from her spinnerets. How the filmy threads glitter in the light of our lamp; for remember the sun has set, and our lantern must aid us in watching Mrs. Epeira at her work. For a few moments she allows the breeze to carry the threads far out from the spinning machine, then with a quick movement she makes the thread fast by touching her spinnerets to the twig. Again she quietly waits; but this time she has turned with her head in the direction in which the threads blew. If we look closely we see that she is holding one of the threads with the claw of her front foot. From the foot the thread stretches to the hooks on her palps, and from these down the middle line of her body to the spinnerets. She is patiently waiting for the free end of the line to catch on some support. Every now and then she pulls gently

"She glides along the frail, swaying thread"

on the slack thread, and with her palps rolls a portion of it into a small white ball, as a fisherman winds up his line when he hauls it in. At last the line pulls taut, and she seems satisfied that it is fixed at the farther end. Just where that may be she does not know, but she is ready to start on an exploring expedition to find out. Never did tight-rope walker perform a more daring feat. With back down and head forward she glides along the frail, swaying thread, walking with six feet while with the last pair she holds tense the new thread that she is spinning. She speeds along so rapidly that you are half inclined to believe that she is floating through the air instead of running along an almost invisible thread.

She has reached that drooping leaf at *b*, ten feet away from her starting-point. She pauses an instant to fasten her new thread, and then glides back adding another strand to her silk rope. She repeats this several times, till the line is strong enough to bear her weight without swaying.

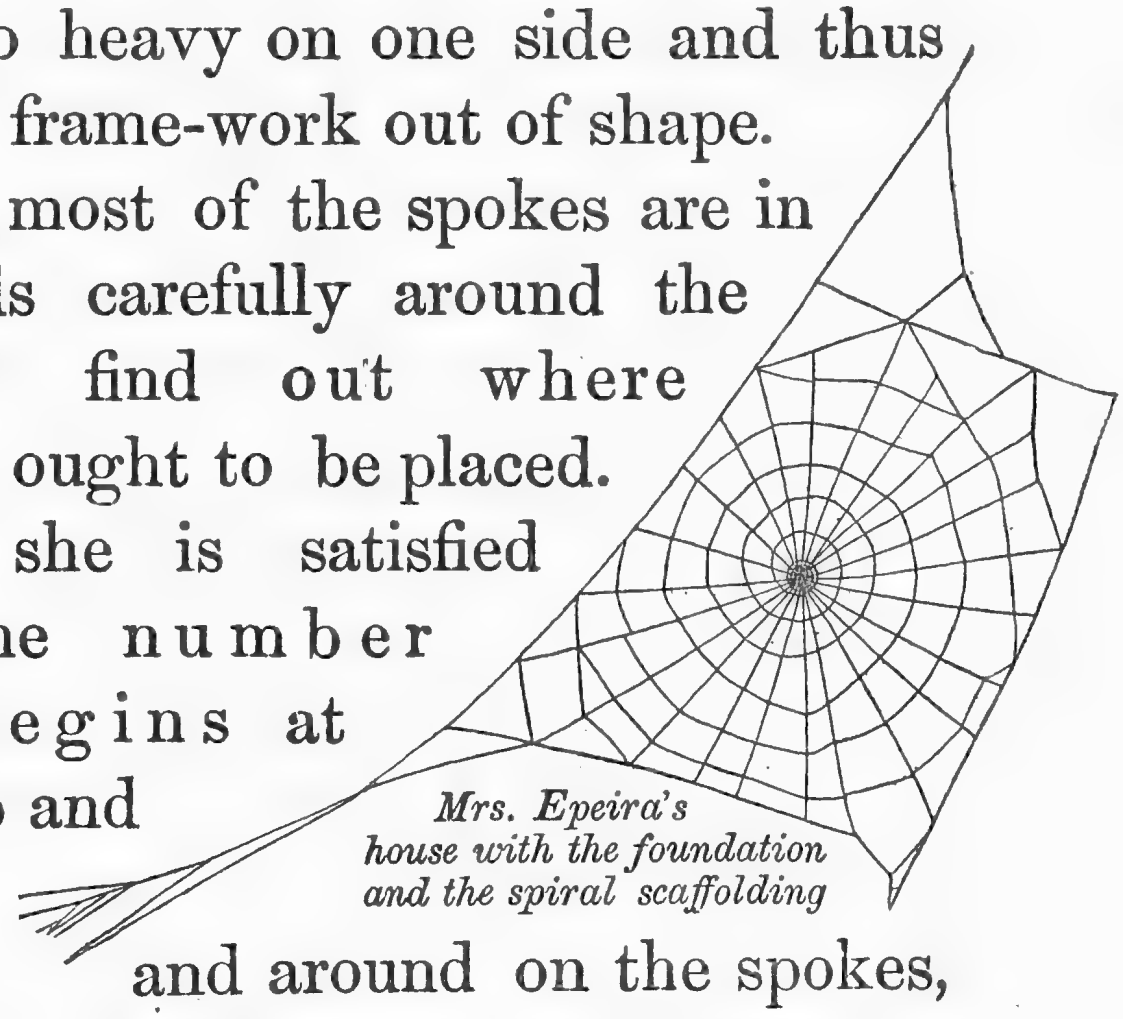
On the fifth trip she stops a moment near the centre of the line to leave a small wad of white silk. When she reaches this dot on her way back she pauses, and then recklessly drops, swinging like a pendulum on the end of the thread she is spinning. She alights on a leaf at *d*, fastens her thread, and at once clambers back to *c*. This line is now strengthened just as the first one was. Now she races down to *e* and drops again, swinging over to *d*, then away to *g* and *h*, repeating the same exploits, till at last the frame-work of her foundation is complete.

She is now ready to put in the spokes, for this house of silk is to be in the form of a wheel. She hurries down from *c*, stops at the middle, and places a dot of white silk. This is to mark the hub of her wheel. Back to *e* she clambers, spinning as she goes. When she reaches *e* she runs down the line *ab*, fastening the new line at 1, and the first spoke is made. Down to the centre she flies on this, and back again with spoke number 2. Back and forth, up and down, this busy lit-tle worker glides till all the spokes are in. Every now and then she stops at the centre to make her hub larger and stronger by fastening a disk of silk to the spokes already made.

You must not think that she makes the spokes one after another, just as they come. She is too wise to do that. Sometimes she makes two very far apart, as 2 and 3, or she goes up *d*

and carries the spoke over to 4. She does this so that her wheel will not grow too heavy on one side and thus pull the frame-work out of shape.

After most of the spokes are in she feels carefully around the hub to find out where another ought to be placed. When she is satisfied with the number she begins at the hub and moves around and around on the spokes, spinning as she goes, and fastening the threads to every spoke. Wider and wider grows the spiral, till at last Mrs. Epeira has reached the outer border of her wheel.



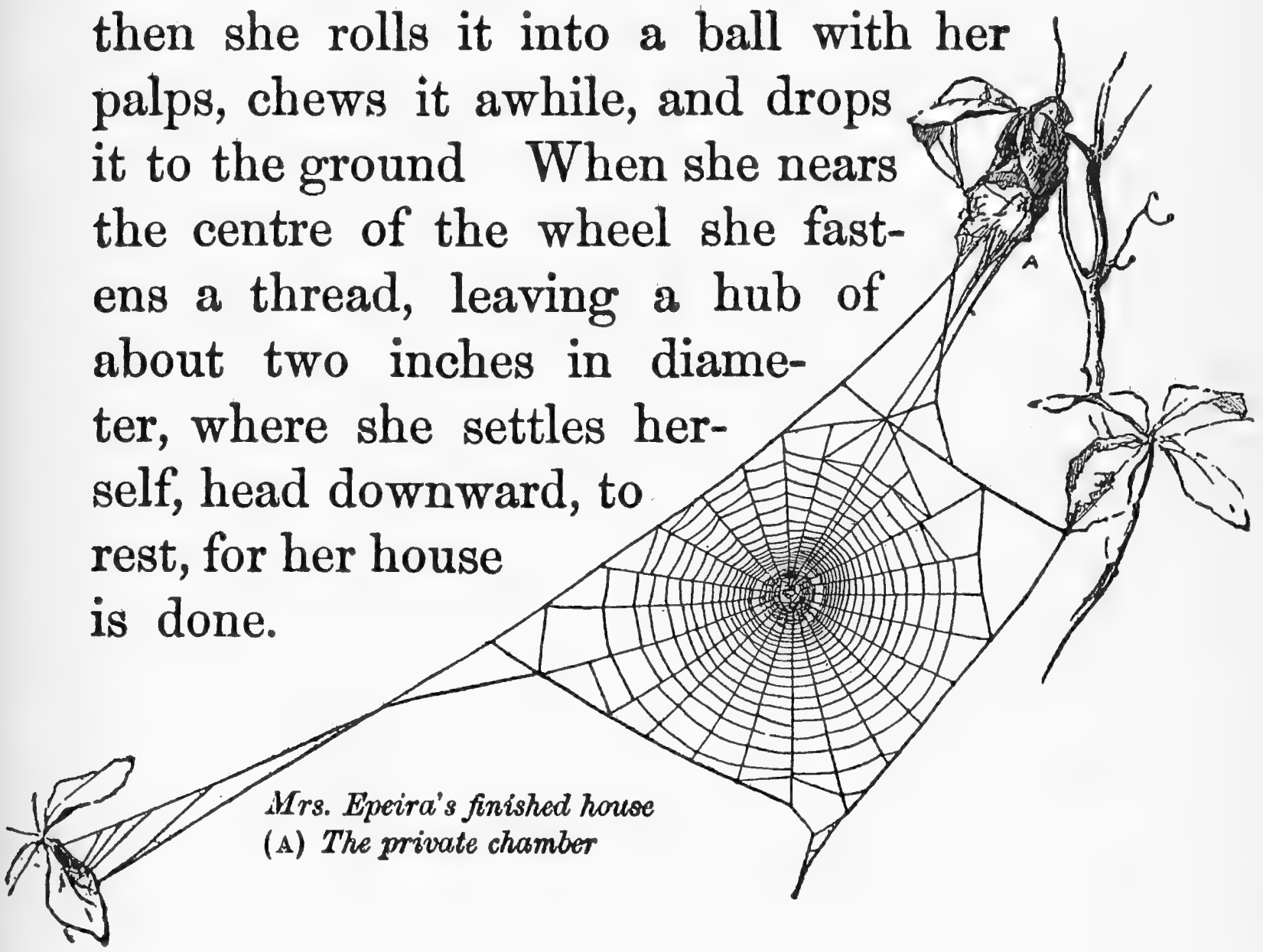
Mrs. Epeira's house with the foundation and the spiral scaffolding

You know when carpenters build a house they make a large scaffold upon which to stand while they are hammering and pounding away on the

building. Now this wide spiral is Mrs. Epeira's scaffold, upon which she walks and stands while she finishes her wonderful house. Another spiral is to go in. She begins this at the outer border; round and round she goes again, fast enough to make her dizzy, if she knew what that meant. This time the threads of the spiral are placed very close together,—less than a quarter of an inch apart. As she moves around, one hind foot holds the thread as it comes from the spinners, and with wonderful skill fastens it to each spoke as she passes by. She never makes a blunder; the quick stroke is never made an instant too soon or too late; it is never too high or too low, but always at the exact moment and the exact place.

But the scaffolding gets in the way of this new spiral. What will this little builder do about it? Just what

carpenters do when they no longer need the scaffold, — tear it down. When she comes to a scaffold thread that is in the way she takes hold of it with her front feet, pulls it up to her mouth and snips it off with her teeth; then she rolls it into a ball with her palps, chews it awhile, and drops it to the ground When she nears the centre of the wheel she fastens a thread, leaving a hub of about two inches in diameter, where she settles herself, head downward, to rest, for her house is done.



Mrs. Epeira's finished house
(A) *The private chamber*

VI

MORE ABOUT MRS. EPEIRA'S HOUSE AND ITS USE

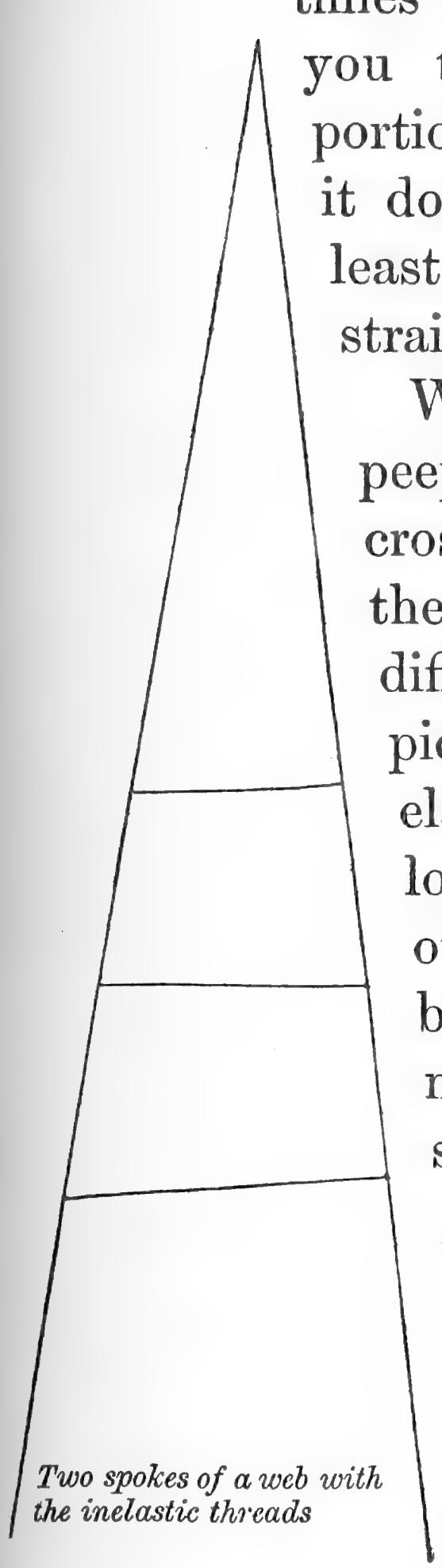
YOU have not forgotten that Mrs. Epeira keeps two kinds of silk stored away in her spinning-machine. She uses both kinds in building her pretty wheel house. The foundation, spokes, hub, and scaffolding are all of the same kind, while the closely woven spiral is of a vastly different sort.

Place your finger on one of the spiral threads. It sticks fast, and as you draw it away the thread stretches like a piece of rubber to three or four

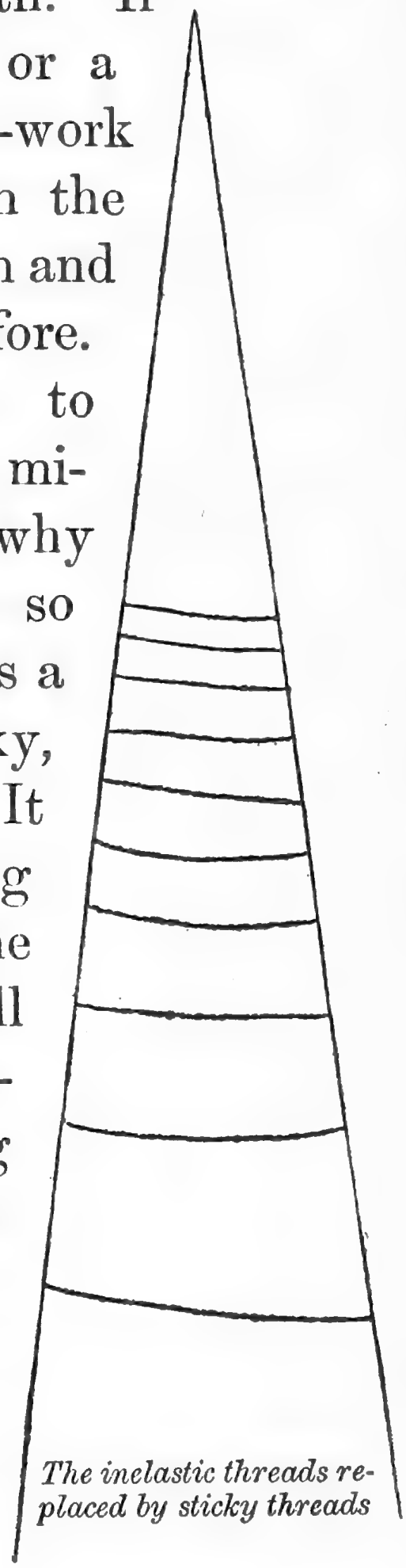
"It looks like a string of tiny beads"

times its original length. If you touch a spoke or a portion of the frame-work it does not adhere in the least, but remains firm and straight as it was before.

We shall have to peep again into the microscope to see why the threads behave so differently. Here is a picture of the sticky, elastic thread. It looks like a string of tiny beads. The beads are small masses of a substance resembling glue. When the thread is first spun this glue covers the entire surface,

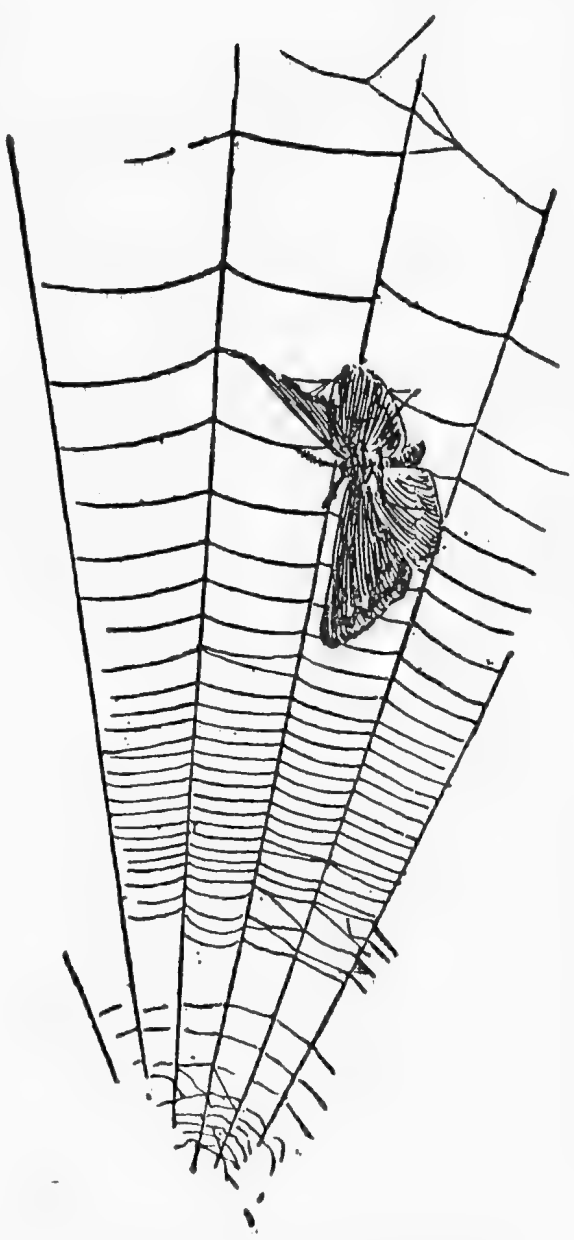


Two spokes of a web with the inelastic threads



The inelastic threads replaced by sticky threads

but after standing in the air a few minutes, the glue breaks up into small bits which collect in the beadlike drops. The inelastic thread is perfectly smooth and dry.



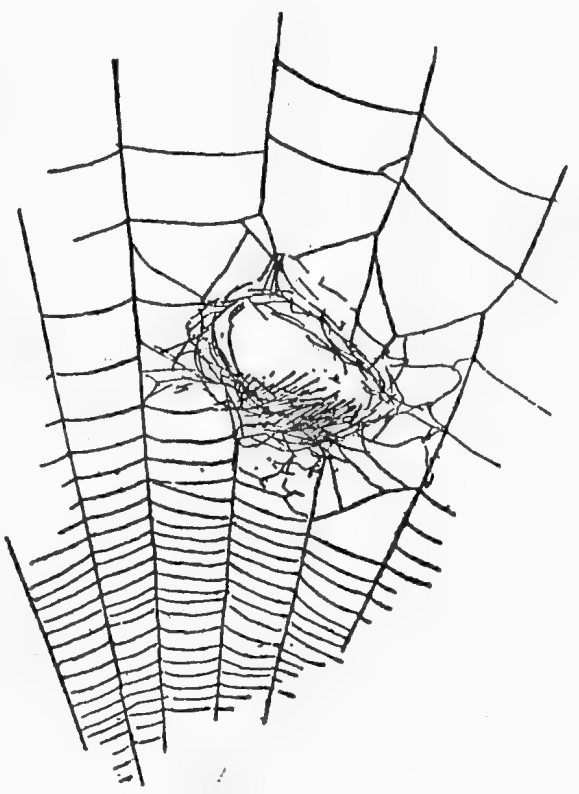
"There, it has touched the wheel"

It would never do to have a stretchy foundation for a house. This the wise little Spinner knows; so she makes the frame-work and spokes out of the firm, dry silk. But the spiral? That is to serve another purpose, for this little house is not made simply to live in, but to act as a snare to catch prey as well.

Already a small moth, attracted by our light is hovering dangerously near the gummy spiral. There, it has touched the wheel, one wing is sticking fast. No use to struggle, poor

moth; the more you try to get away, the more the cruel threads cling and hold you fast.

Mrs. Epeira at her resting-place on the hub knows the instant the moth touches the web. She dashes toward it, being careful to step upon the spokes and not upon the spiral. She does not care to have her own feet tangled up in those sticky threads. She seizes the insect with her front feet, tosses it backward till it rests in the grasp of all eight feet, then she rolls it over and over, wrapping it up in a band of white silk which she spins at the same moment. When this is done you no longer recognize the moth, for with wings and head and feet bound together it has become a little white mummy.



"It has become a little white mummy"

With the mummy firmly grasped in her claws, Mrs. Epeira swings clear of the web, clambers up to the hub on a thread which she has left for that purpose, and settles down to enjoy her supper. She is not so intent upon her eating that she cannot notice the entrance of other insects into her house. She scampers first in one direction and then in another, securing all the intruders, just as she did the first one. Some of them she hangs up in the dining-room at the centre; others, when she has wrapped their mummy-cloths around them, she leaves dangling in the web where they were caught.

Great rents are torn in the pretty silken house on which she has spent so much pains and labor. She does not mind that, for she is such an extravagant little body that she expects to make herself another new house

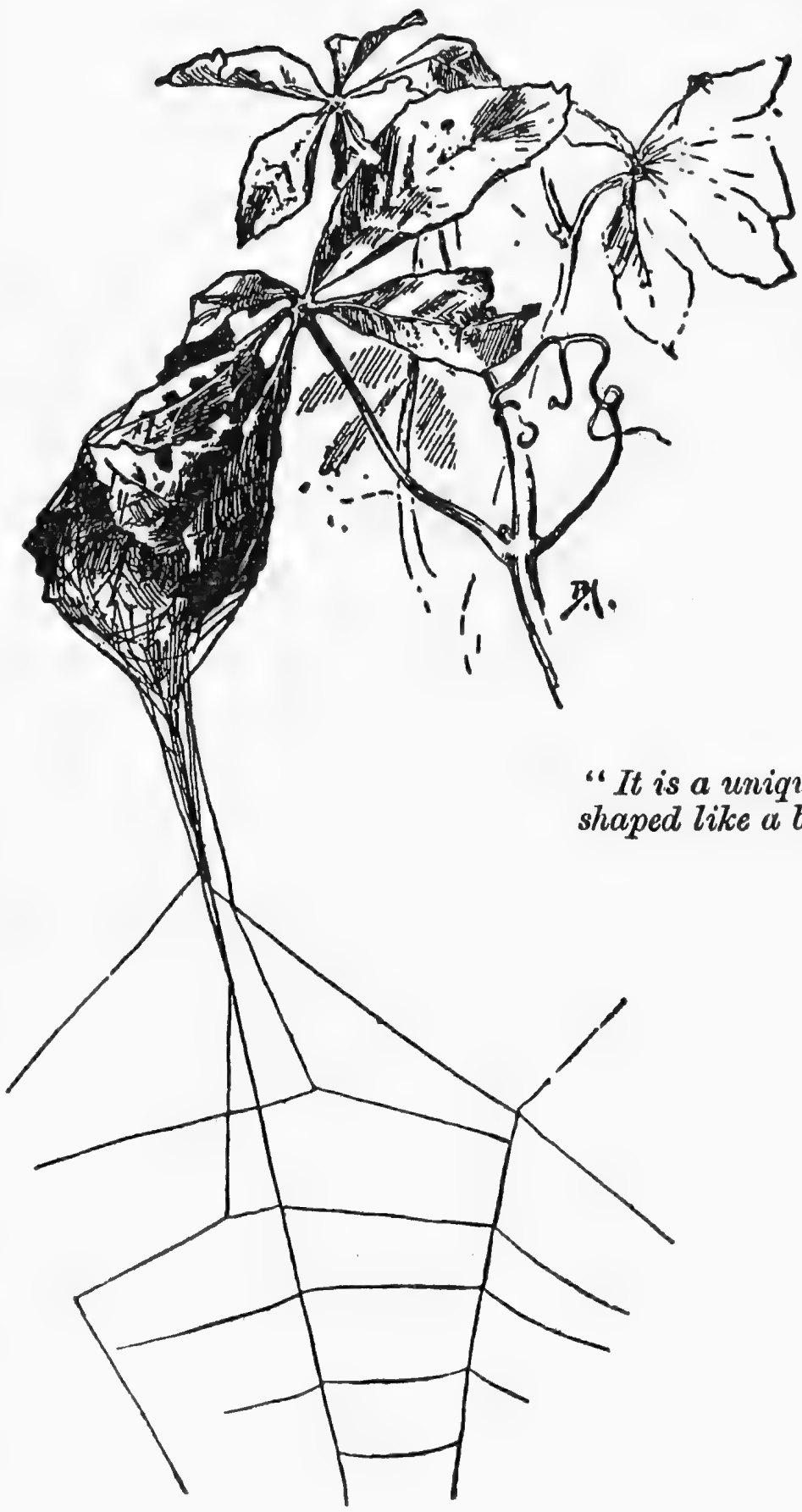
the next night. Now and then by patching the rents she manages to make one web last two nights, but usually, she builds a new one every evening.

She might feel more concern over the torn and frayed threads if she expected to stay in this house during the day. But she knows that another apartment is awaiting her, to which she may hasten at the earliest morning light if she chooses.

This apartment is her private chamber. It is a unique little room shaped like a bell. It is made from the growing leaves of the vine. These Mrs. Epeira has ingeniously caught together at their edges and fastened with silk threads. In the upper part of the bell she has spread a mat of dotted silk. Upon this the little lady stretches herself and sleeps or rests, feeling perfectly secure from all in-

LLOYD LIBRARY CINCINNATI OHIO

truders, for only those who know her secret would ever suspect that the innocent-looking bunch of leaves formed the walls of Mrs. Epeira's sleeping-room.



" It is a unique little room, shaped like a bell"

VII

SOME OF MRS. EPEIRA'S NEIGHBORS

NOT far away from Mrs. Epeira's home lives one of her relatives, Mrs. Ar-gi-ó-pe, the Autumn Spider. She does not choose as high nor as open a position for her house as her pink-gowned neighbor does. She places it down among the bushes, where it is partially concealed by the stems and leaves. She has a good reason for this; for she does not possess a dainty bell-chamber to which she can hasten whenever she wishes to keep out of the way of prying eyes. One apartment is all that she has in her house. She eats and sleeps and spends all her time in her large lacy room of silk. We do not

have to wait until evening to make her acquaintance, for she is always at home ready to receive callers.

Mrs. Ar-gi-ó-pe is dressed in a rich suit of black velvet, trimmed on the back with bands of bright yellow. The cephalo-thorax is decked with spots of pure white, while her long legs are clad in black and brown. She is much larger than our friend, Mrs. Epeira; indeed she is one of the largest Spinners that inhabit the temperate climate. We are told that her sisters in the tropics are as large as mice, and are dressed in the most gorgeous colorings.

Mrs. Argiope is called the Autumn Spider, because most people believe that she visits us only in the latter part of summer and in autumn. The truth is that the little lady is with us all summer long, but we do not recognize her. While she is growing, she

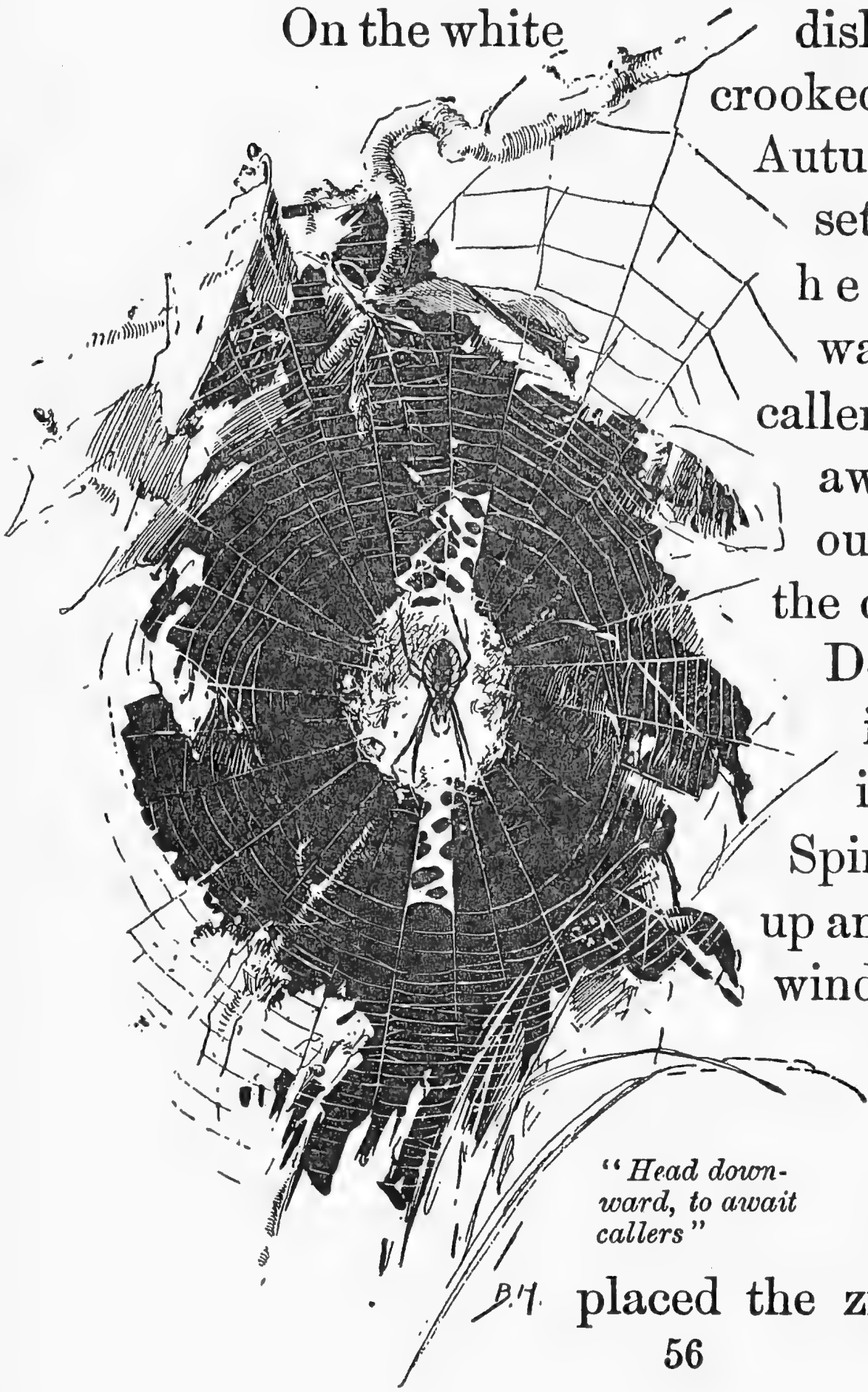
dresses in a modest suit of black and white. Toward the end of summer, when she is fully grown, she dons her conspicuous yellow gown, and people think that she has just arrived from some far-away region.

The home of the Autumn Spider resembles that of Mrs. Epeira in many ways. It is a wheel hung vertically, as hers is. It has the same sort of substantial foundation, — the inelastic spokes and the sticky, elastic spiral. The centre, however, shows that Mrs. Argiope has some ideas of her own in building a silken house. At the centre is a disk of white silk about an inch in diameter. Around this is a spiral of inelastic silk, which meets the sticky threads about two inches from the centre, making the hub fully four inches across. Directly above and below the disk, and meeting it, is a zigzag band of white silk, making

a fairy staircase, which reaches from one end of the hub to the other.

On the white disk and the crooked stairs Mrs. Autumn Spider settles herself, head downward, to await callers or to sleep away the tedious hours of the day.

Do not imagine that this interesting Spinner walks up and down her winding stairs. She is too big for that. She probably placed the zigzag band

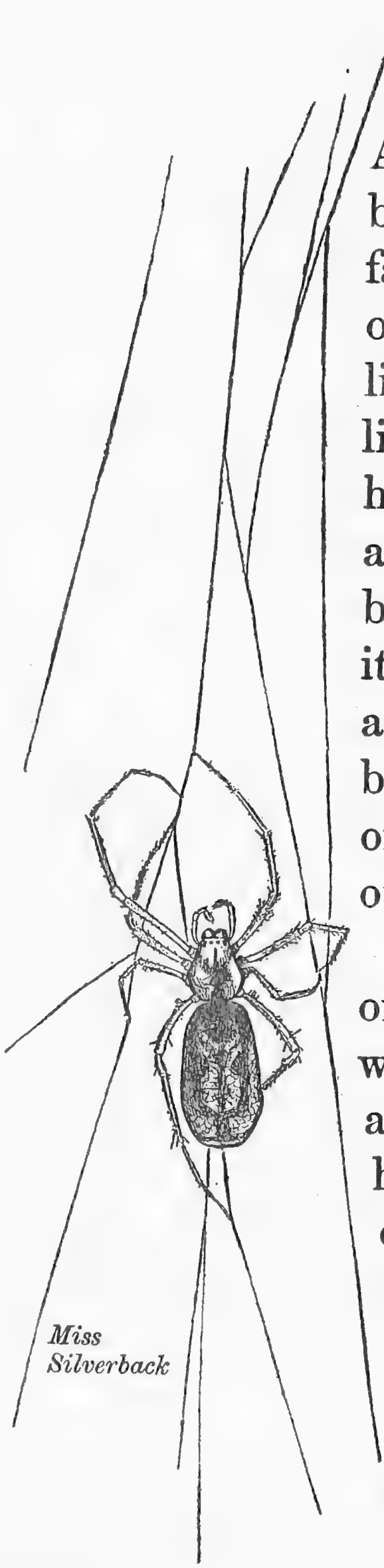


"Head downward, to await callers"

in the web to brace it while she is practising her gymnastic exercises.

See what she does when I touch her web near the centre. She begins to vibrate back and forth; she swings, faster and faster, till she looks like a mere thread of black and yellow in the air. Now if a bird has decided to make a meal of Mrs. Argiope don't you think it will have a hard time trying to catch her while she is vibrating so rapidly? It will no doubt fly away and seek a dinner elsewhere; and that is exactly what Mrs. Argiope expects it to do. Don't you think that is a pretty clever way to outwit an enemy?

Most of the Autumn Spiders prefer to set up their homes in the fields rather than in our gardens. Often you may find a whole colony of them, with their houses placed in a row among the tall grasses and weeds which border the pastures and meadows.



Miss Silverback

We have only to take a step or two from Mrs. Argiope's house among the bushes to find ourselves face to face with another of our garden neighbors, little Miss Silverback. This little Spinner does not swing her wheel-house vertically, as her larger relatives do, but horizontally, attaching it by cables to the twigs and leaves at the sides, and beneath to a wonderful bit of trestle-work built up out of dainty silk cords.

This little Spinner lives on the underside of the web, back downward; so, as you look down upon her, you always see the underside of her body. The first thing you notice

when you see her is a crescent spot near the centre of the abdomen. It flashes and gleams as she moves about, till you are ready to declare that it is a spark of fire. It is not, however, but only a bit of exquisite metallic coloring. The rest of her gown is in keeping with this brilliant bit of trimming. It is dark-green and black on the abdomen and waxlike white on the cephalo-thorax, while her eight slender legs are clad in light green dotted with black. All this shows from the under side. But you must get a glimpse of the upper surface. Here the abdomen has bands of real silver running the entire length. These are separated by stripes of black bordered with green. The cephalo-thorax has the same wax-like cover that it has on

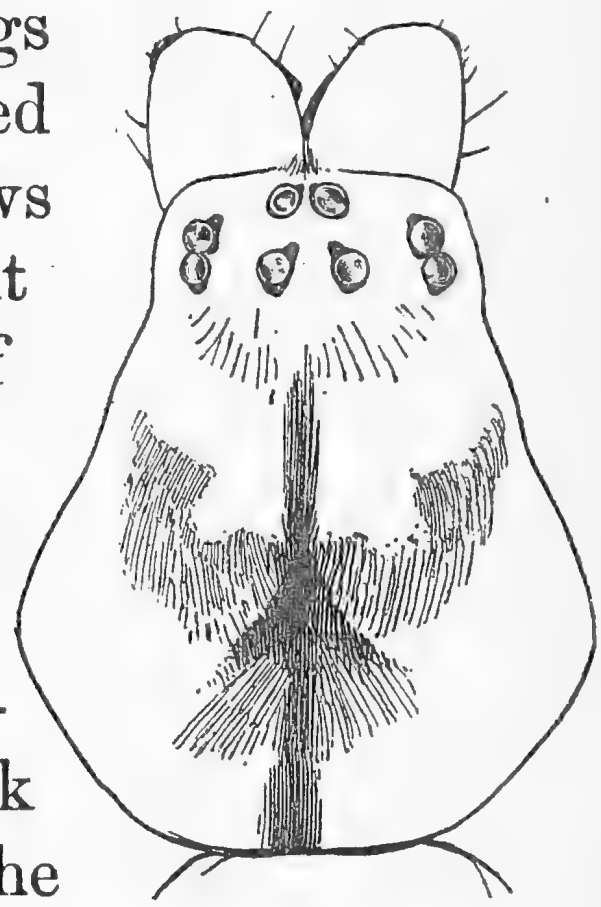


Diagram of Silver-back's eyes.

the under side, and near the front are the eyes, of a rich mahogany shade, arranged as you see in the diagram.

This gayly dressed little lady lives in her lacy house all day long. If you are quiet and do not shake the bushes around her when you make your call, you may watch the dainty little Spinner as long as you choose. But if you are too noisy to suit her, she glides away on one of her silk cables and hides under a leaf, not coming back till she thinks you have left her neighborhood.

VIII

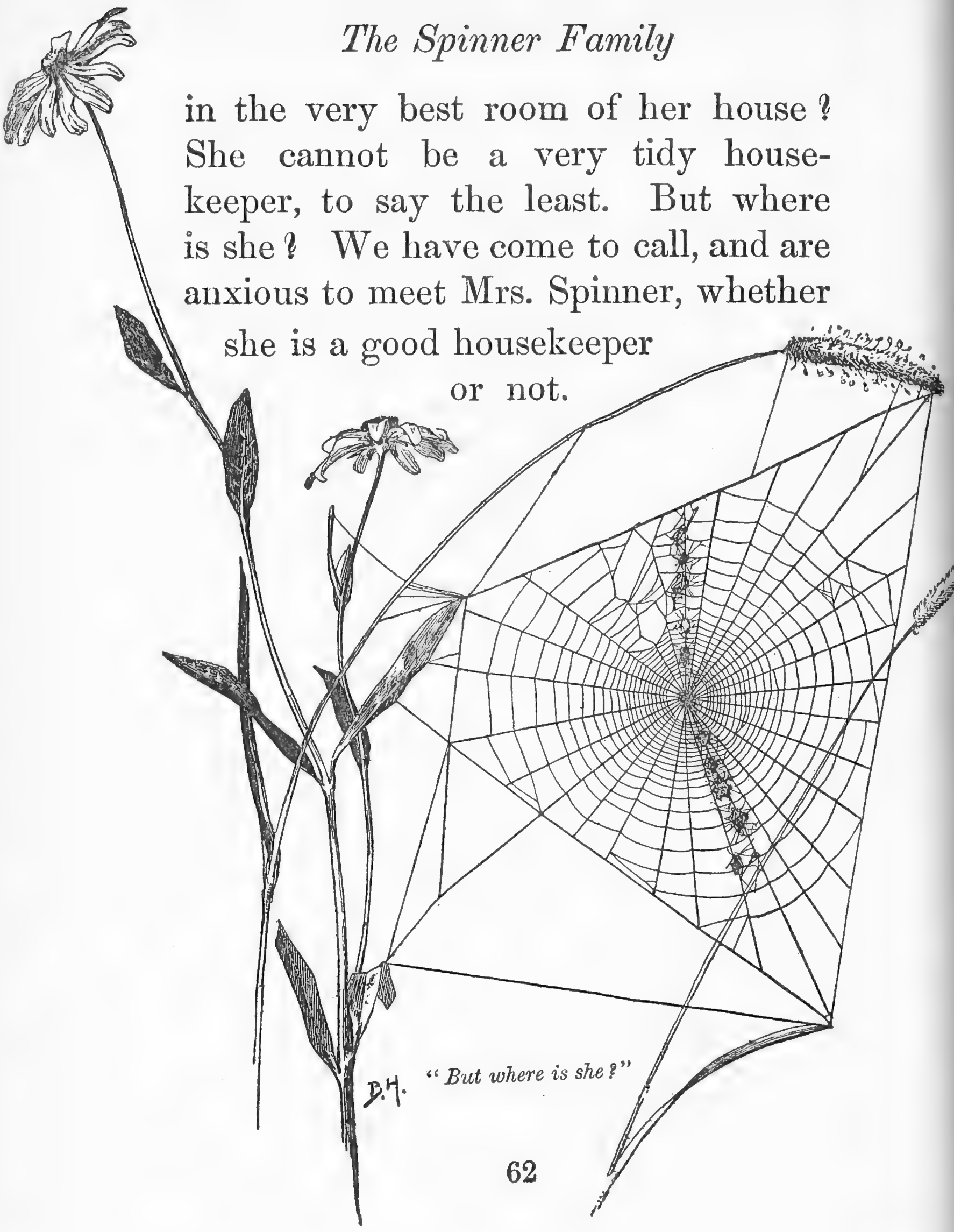
MORE NEIGHBORS, THE HUNCHBACKS AND MIMICS

THE garden seems to be a favorite location for Spinners. Here is another swinging web, not two feet away from Miss Silverback's home.

This wheel, like Mrs. Epeira's, hangs in a vertical position. The owner has taken no pains to conceal it; on the contrary, she seems anxious to show it off, for there is a row of small balls of dirty silk, crumpled-up skeletons and wings of insects, and bits of bark, extending across it from top to bottom.

What do you suppose any Spinner means by hanging up a string of dirt

in the very best room of her house? She cannot be a very tidy housekeeper, to say the least. But where is she? We have come to call, and are anxious to meet Mrs. Spinner, whether she is a good housekeeper or not.



B.H. *"But where is she?"*

She is hiding from us, and like the thimble in the old game of "I spy," she is in plain sight.

There, I shall touch each of those balls, beginning at the top. Nothing happens till I put my finger on that piece of bark a little below the centre. It falls to the ground, and lies there, motionless. A quarter of an hour passes and then the piece of dead bark begins to wriggle. There! it has come to life, and is clambering up a thread toward the web, as a sailor would climb a mast. So that is the little housekeeper! She has been playing a joke on us. She is a dumpy little body, with short legs and small cephalothorax. Her abdomen is the largest part of her body, and is covered with tiny knobs. Her dress is dull brown, speckled with gray.

When this little hunchback has reached the spot from which she fell,

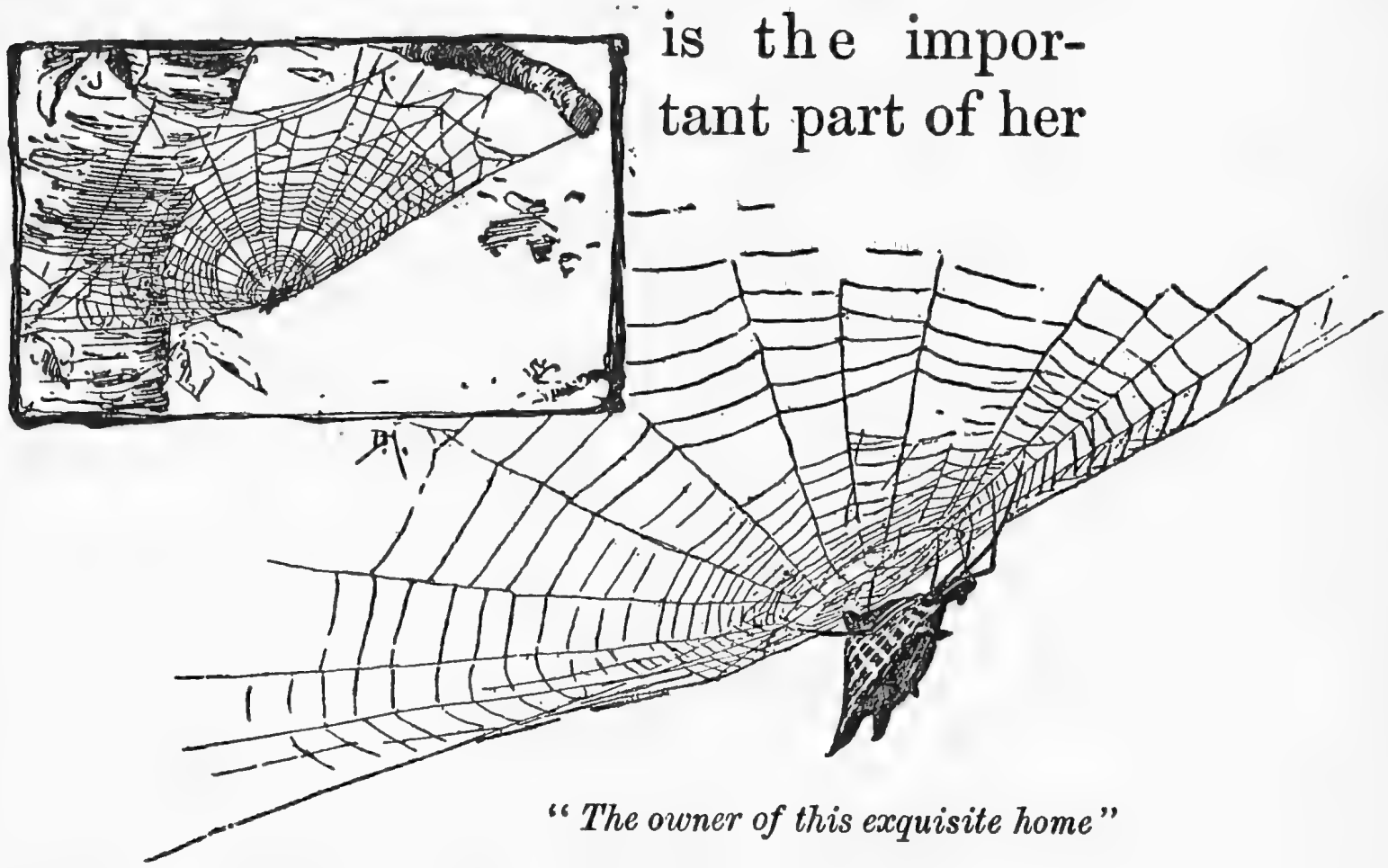
she settles down, tucks her legs up under her, draws her cephalo-thorax close to her abdomen, and there she is, looking just as much like a ball of dirt as those hanging above and below her. What a clever little body she is to find such an ingenious method to hide from her enemies.

Not far away, in the lower branches of a cherry tree, another hunchback has her home. Part of her foundation threads are fastened to two dead branches, that have been sawed off two or three feet from the trunk of the tree. The web is hung neither vertically nor horizontally, but obliquely. Of all the lace houses in the garden, this one is most beautiful in form and workmanship.

"As a sailor would climb a mast"

The owner of this exquisite home is such a queer-looking little body that you would never suspect her of belonging to the Spinner family.

Her cephalo-thorax is so tiny that it is hardly noticeable. The abdomen is the important part of her



"The owner of this exquisite home"

body. It is in the form of a pyramid, with the base uppermost. The sides are inconspicuously streaked with brown and buff, while the upper part is mottled black and white. A rim extends around it, with eight pointed projections.

You have seen a little flowerless plant, called a fungus, that grows in tufts and scallops upon dead logs and

"Her disguise is complete"

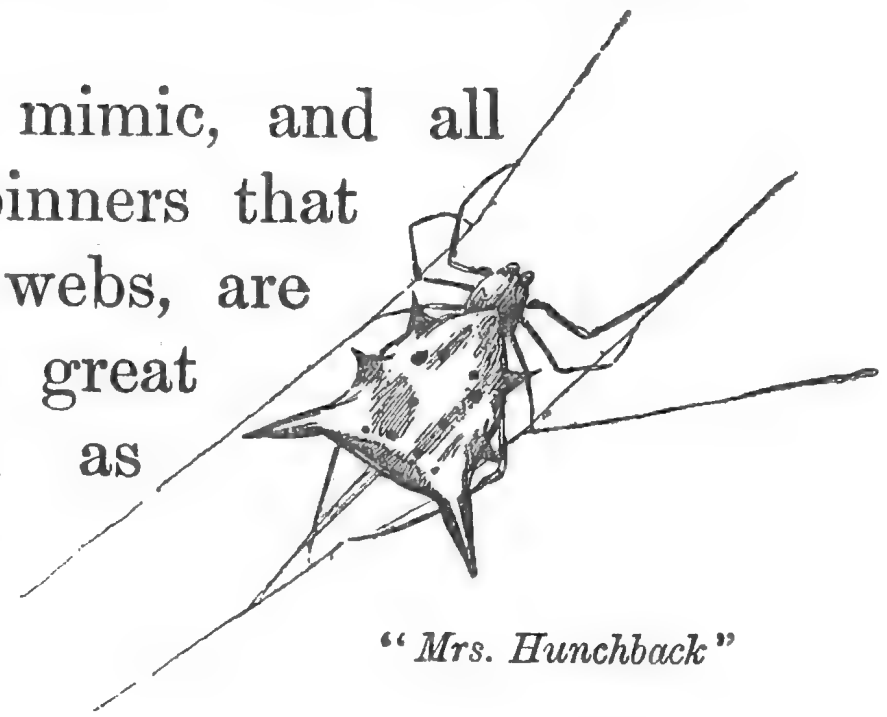
trees. When Mrs. Hunchback hurries from her web, and settles herself upon one of the dead branches, you would have to look very closely to distinguish her from a tuft of white and black fungus. I suppose that is what she wants you, and all her enemies, to think that she is.

Another dainty home is situated in the same bush with the little hunchback who tried to make us think she was a bit of dry bark. No balls of dirt are scattered about this house, but there are two small straws, lying side by side, in the lacy film.

Ah, I am afraid that you are allowing another Spinner to play a trick on you. The truth is that those bits of straw are Mrs. Spinner herself. How can she make herself look like that?

Easily enough. Her body is very slender and the exact color of straw. She stretches two pairs of her long, slim legs backward, and two forward, as you see in the picture, and her disguise is complete.

This little mimic, and all the other Spinners that make wheel webs, are put into one great class known as orb-weavers.



"Mrs. Hunchback"

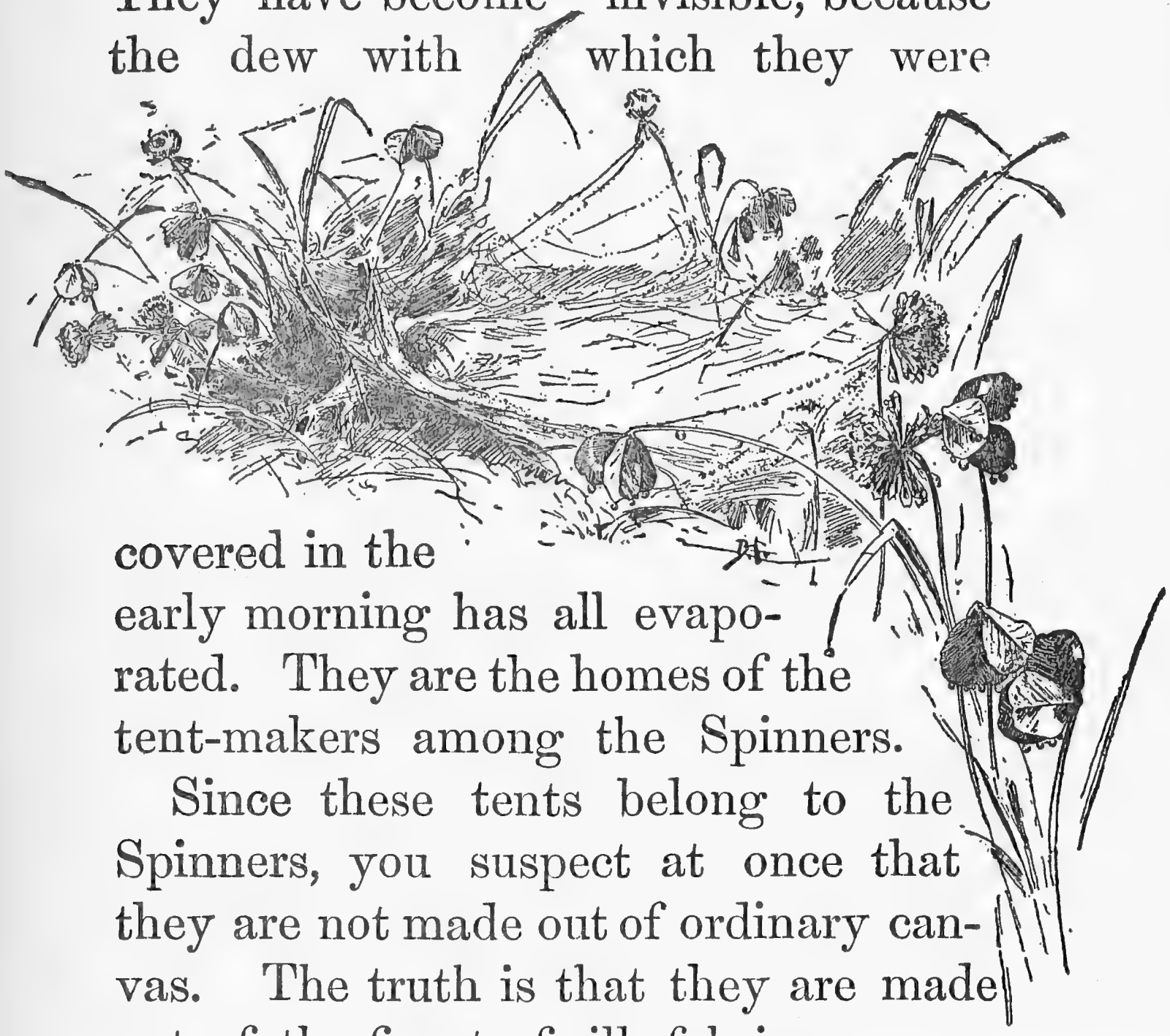
IX

THE TENT-MAKERS

HAVE you ever looked out of your window on a summer morning to find the yard below completely covered with small white tents? You half suspect that a regiment of fairy soldiers camped there during night, and forgot to hie away at break of day, as all good fairies are expected to do.

By the time the sun has been shining two or three hours the tents have apparently disappeared, and you are almost ready to believe in the fairy story.

Nevertheless, the tents do not belong to fairies, neither have they disappeared.



They have become invisible, because the dew with which they were covered in the early morning has all evaporated. They are the homes of the tent-makers among the Spinners.

Since these tents belong to the Spinners, you suspect at once that they are not made out of ordinary canvas. The truth is that they are made out of the finest of silk fabrics.

The dwellers in these tents are commonly called grass-spiders, because so many of them live in the grasses of the lawns and meadows. Their real family name is Agelenæ, but if we

are to talk about one member of the family, we shall call her Agelena.

Mrs. Agelena does not carry her tent about and pitch it where she chooses, as you do when you go camping in the summer time. But she decides where it is to be, and then skilfully sets about weaving the cloth and pitching the tent at the same time. She fastens her warp to the blades of grass on every side, then she works in the woof by walking rapidly back and forth and spinning as she goes. When the tent cover is of sufficient thickness she fastens numerous guy ropes to the blades of grass both above and below. She has no intention of having her tent blow away because of insecure fastenings.

When we look closely we see that after all this is no ordinary tent. But then you would not expect a Spinner to make an ordinary one, would you?

It has a stairway leading from the flat roof to the ground-floor beneath. It is a pretty tunnel-staircase slanting obliquely downward. There are no steps, but Mrs. Agelena does not need steps when she has twenty-four claws to help her to climb up a smooth surface.

Sometimes this elaborate tent has a cellar as well as a ground-floor. This is a crack or a crevice in the ground. When this is the case the stairway always ends in the cellar.

Mrs. Grass-Spider does not look very much like her relatives the orb weavers. She never dresses in bright colors as they do, but wears an inconspicuous suit of dark-brown or gray. Her abdomen and cephalo-thorax are almost equal in size. At the end of the abdomen are two pointed projections like a pair of pincers. These are the hinder pair of spinnerets, the pair that she makes the most use of

when weaving the delicate covering for her tent. The other Spinners are shorter, and cannot be seen without looking on the under side of the body.

"Peeping out upon the roof"

Mrs. Tent-maker is always at home. If you are very, very quiet as you approach her house, you will find her sitting in her stairway peeping out upon the roof. If you disturb her

by shaking the grass-blades, you will probably catch a glimpse of her eight legs as she whirls down her stairs, and seeks a place of safety in her cellar, or among the roots of the grass on the first floor.

"Mrs. Grass-Spider"

Mrs. Agelena does not build a new home every night, as the orb weavers do. Indeed, if you do not ruthlessly tear down her tent with your lawn mower or sickle, she makes one last several weeks. True, she fixes it up occasionally, putting a new border all around it, and a fresh layer of threads on the upper surface.

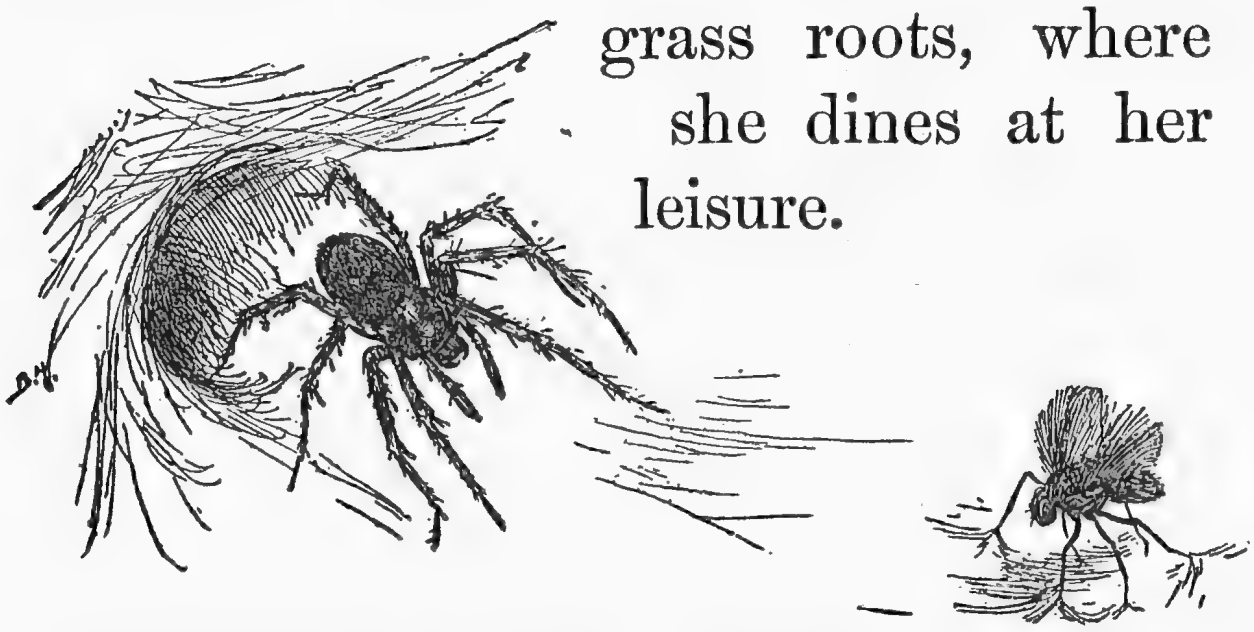
None of the Spinners come to us in greater numbers than the tent-makers. Not only do they camp out on our lawns and meadows, but certain species pitch their tents upon the horizontal branches of the shrubbery in the gar-

den. Others stretch their filmy canvas in fence corners and make a cellar out of a knot-hole in a post. Some of the most ambitious among them clamber up the side of a haystack and camp out on the very summit of the fragrant pile. Another kind enters our homes and swings her tents, like hammocks, in the corners of the rooms, or in the window-cases of the cellar, or in any other niches where the tent may be swung and the owner find a safe retreat from the lower end of her stairway.

Like the orb-weavers the tent-makers use two kinds of silk. The tent is made chiefly of the dry, inelastic kind, but over the upper surface there are stretched a few threads of the gummy, elastic silk. You can determine this for yourself; touch the under surface of the tent with your finger, and nothing happens. When you touch the upper surface

some of the threads stick to your finger, just as the spiral in Mrs. Epeira's wheel did.

The reason for the sticky threads is obvious. If a fly or beetle or cricket happens to step or alight upon Mrs. Agelena's tent, it becomes tangled up in the threads, and before it can extricate itself Mrs. Spinner has darted from her stairway, where she has been hiding, and clutched the luckless insect in her claws. She dashes down the stairs, and hides among the grass roots, where she dines at her leisure.



"Mrs. Spinner has darted from her stairway"

X

MRS. HOUSE-SPIDER

BESIDES the little tent-maker who likes to pre-empt the corners of our cellar windows for her building-place, another of the Spinners always sets up her housekeeping somewhere about our homes. For this reason she is called the house-spider. Indeed, in some mysterious way this Spinner seems to belong to people, for wherever civilized man is found she is sure to make her appearance. She crosses the sea in our ships, and no doubt the continent in our trains.

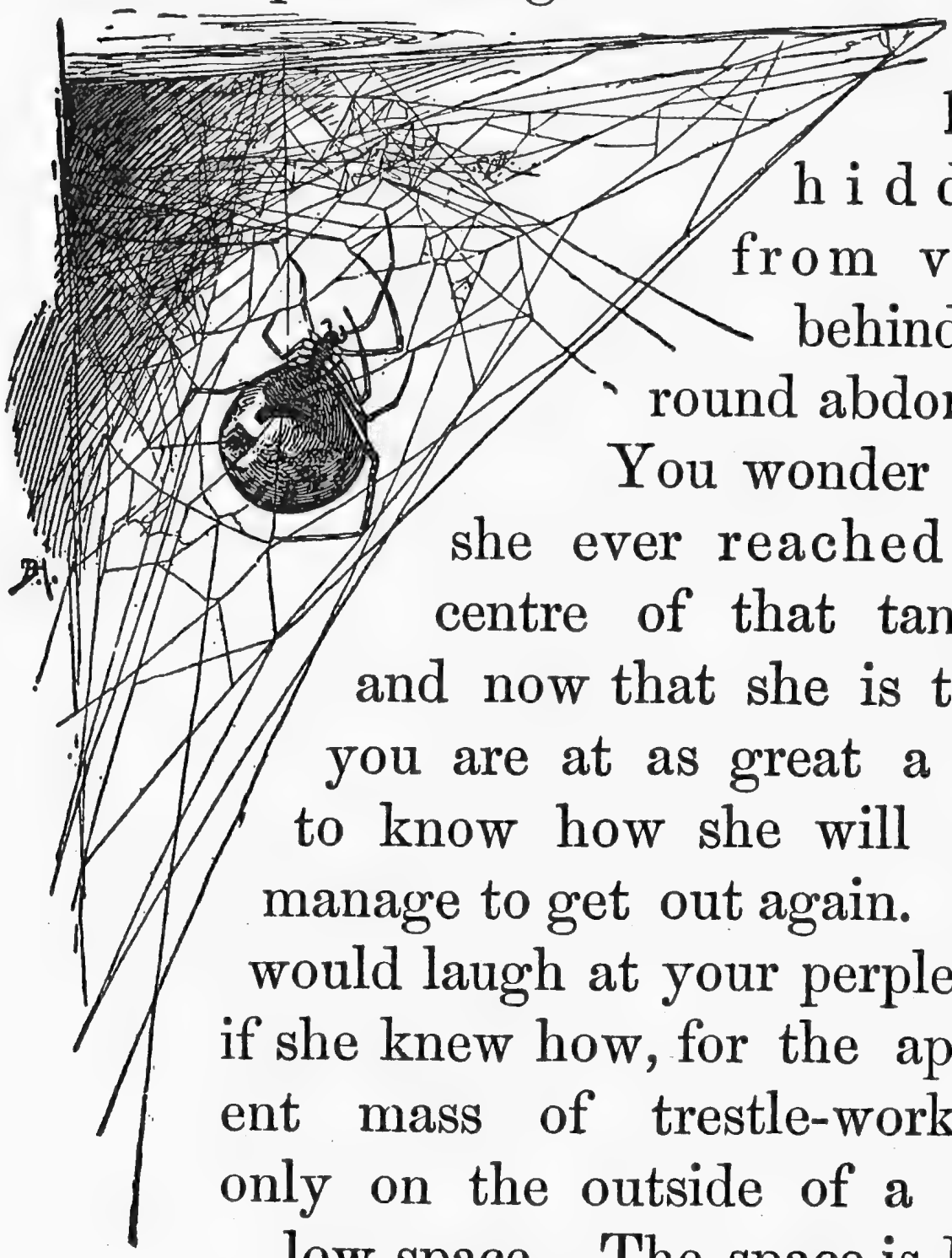
She is a timid little creature, choosing the most secluded nooks and cor-

ners for her dwelling-place. No spot suits her better than the dark spaces under the cellar stairway, or the dim recess behind a heavy piece of furniture.

Her real name is Mrs. Theridion. She dresses in a dark-brown suit which is slightly mottled with white on the upper side of the abdomen. Her cephalo-thorax is small, while her abdomen is large and round, making her look like a ball as she hangs from her web.

Her house is not so pretty as the tent-makers, nor so artistic as the exquisite lace wheels of the orb-weavers. At first sight you think it is nothing but an irregular mass of tangled threads. A closer look reveals that it is a marvellous piece of trestle-work, with an intricate network of threads crossing and recrossing each other, and with numberless cables stretching to the walls and floor on other supports.

In the midst of the meshes Mrs. House-Spider hangs, back downward, her head hidden from view behind her round abdomen. You wonder how she ever reached the centre of that tangle; and now that she is there you are at as great a loss to know how she will ever manage to get out again. She would laugh at your perplexity if she knew how, for the apparent mass of trestle-work is only on the outside of a hollow space. The space is Mrs. Theridion's room, and the trestle-work forms the walls of her house. The room is open below

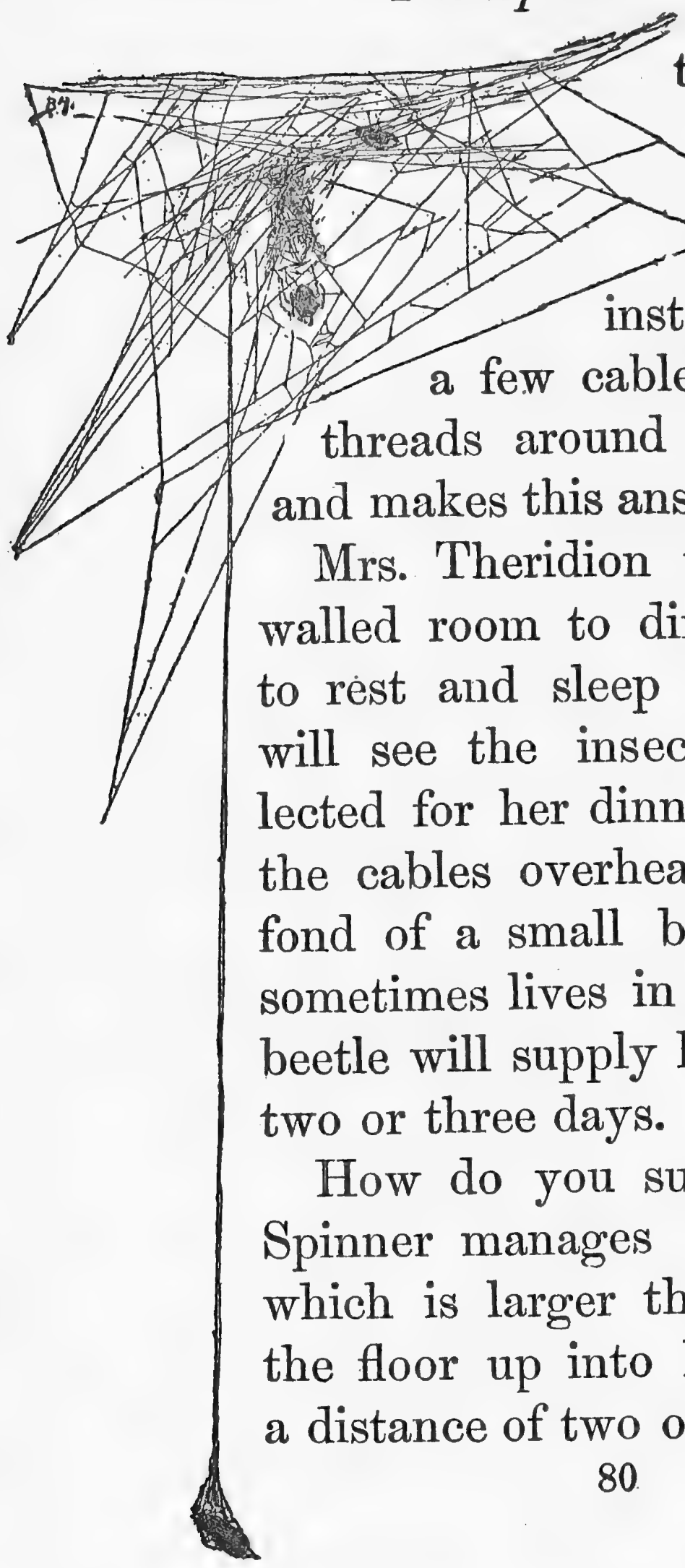


"Like a ball as she hangs from her web"

and also above. When the owner of this unique house wishes to leave it, all she has to do is to clamber up one of the cables stretching to the support overhead, or glide down one which reaches to the wall or floor beneath.

All day long this Spinner may be found in her strangely walled room. She is so quiet that she scarcely seems to be alive; the truth is she is taking a good sound nap. Like so many of her kindred she has learned to sleep during the day and work at night.

If left undisturbed, the house-spider, like the tent-makers, makes one house last a long time, sometimes all summer. However, if you come with your broom and ruthlessly demolish her web, she patiently sets to work, as soon as darkness protects her from prying eyes, to construct another, thankful, no doubt, to escape with her life. If the destruction of her home continues, she ceases



to build the elaborate structure we have described, but instead she stretches a few cables, places a few threads around a small room, and makes this answer the purpose.

Mrs. Theridion uses her trestle-walled room to dine in as well as to rest and sleep in. Often you will see the insects she has collected for her dinner hanging from the cables overhead. She is very fond of a small black beetle that sometimes lives in the cellar. One beetle will supply her with food for two or three days.

How do you suppose this little Spinner manages to get a beetle which is larger than herself from the floor up into her dining-room, a distance of two or three feet?

"The beetle is hoisted to the desired position"

This is what she does. She attaches several threads to the beetle's body, then climbing up one of her rope ladders, she fastens the threads above and waits. The threads dry and contract, and the insect is carried up a short distance. Again she attaches threads to her prey and fastens them higher up than before. She repeats this again and again, and thus little by little the beetle is hoisted to the desired position.

I am sure you will agree with me that Mrs. Theridion may well be proud of her skill as a mechanic.

XI

THE SILK-COMBERS

YOU remember that Mrs. Epeira sometimes uses the soft hairs on her legs to brush the dust from her gown, or to clean her face and eyes. All the Spinners that we have met — Hunchback, Tent-makers, House-Spider and all — have the same cleanly habit.

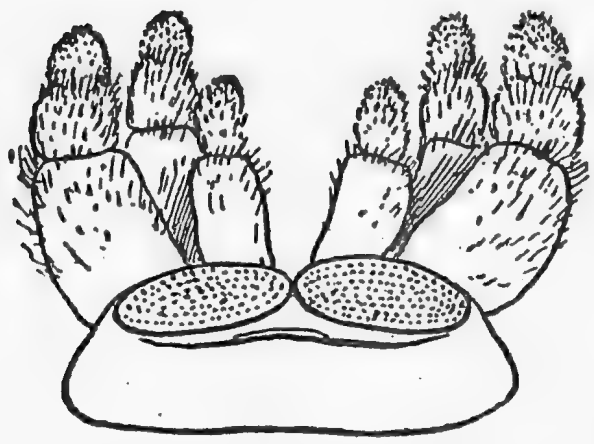
Now we are to meet a Spinner who, besides the usual brushes, always carries about with her two large coarse combs. These combs are made of stiff hairs and are fastened to the Spinner's hind legs. Each comb extends along the outer, upper surface of one entire segment, the sixth, or the one nearest the foot.

You may think that this Spinner has a great deal of hair, since she possesses two combs, but she has not. She has another use for her combs than that of hair-dressing.

Mrs. Epeira and each of her friends that we called upon have six spinnerets. This little Miss Comber is not satisfied with six fingers in her spinning-machine. She must have an additional organ. This organ lies just in front of her spinners and looks like a small, oblong plate. The plate is full of minute holes which are very much smaller than the holes in the spinners, and those you know are so small that you cannot see them without the aid of a microscope. This porous plate is called the cribellum.

But what has all this to do with the combs? If we can catch Miss Comber building her house we shall see for ourselves what her combs are good for.

She often chooses for her building-place some of our common roadside plants. No site is more to her liking than a cluster of goldenrod or a bunch of wild asters.

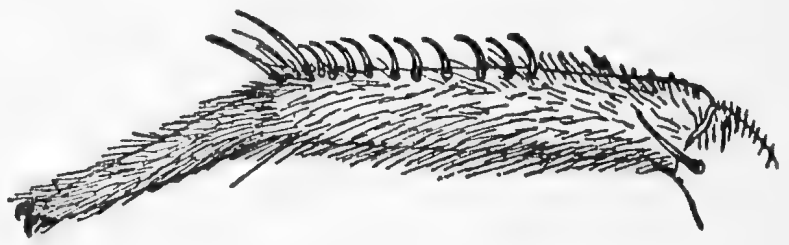


Cribellum and spinnerets of the Silk-Comber

She makes her foundation of the same kind of dry, inelastic silk that all her sisters use. These threads are stretched irregularly from one leaf or flower to another. Sometimes all the flowers on one plant are tied together with these dainty cords.

When the frame-work is done the Spinner is ready to build in cross pieces and squares of silk from her cribellum. And now for the combs. She places one of her hind legs under her abdomen so that the comb is directly under the cribellum, the foot resting upon the other hind leg. This done, she moves her legs rapidly back

and forth so that the comb pulls the fine threads from the cribellum and at the same time tangles them into a white, curly band.



Leg of the Silk-Comber

This band is made of the stickiest kind of silk, and never fails to hold fast any insect that touches it. If you could catch hold of one of these curled bands between the thumb and finger of each hand you could pull the kinks out of it, stretching it to at least ten times its former length.

Some of the curly-thread weavers who live in the woods make a web something like Mrs. Epeira's, only it is triangular in form instead of round. The lines that correspond to Mrs. Epeira's spiral are made of the curled silk bands.

XII

THE JUMPERS

WE are now ready to be introduced to some members of the Spinner family who care very little about spinning and weaving. They never build dainty lace houses, nor pitch filmy tents in which to settle down and live their lives in one neighborhood. Instead, they move about from place to place, hunting for food and seeing the world as they go, contentedly putting up for the night or for rest in any place that may offer itself when the time comes.

Sometimes they take lodgings under a leaf in the garden, or under a pile of chips in the yard; often beneath the

loose bark on a log or fence post. Sometimes they creep into crevices or cracks in the walls of a building.

The family name of these little wanderers is Attidæ, but they are commonly known as the Jumping Spiders.

The Attida whom we shall call Miss Velvetgown is one of the best known of all the jumpers. She is a trim little body, wearing always a becoming black velvet suit trimmed with a few dots of orange on the back. Like all of her family she has a short, flat body. Her legs are short and stout and all four pairs are almost equal in length.

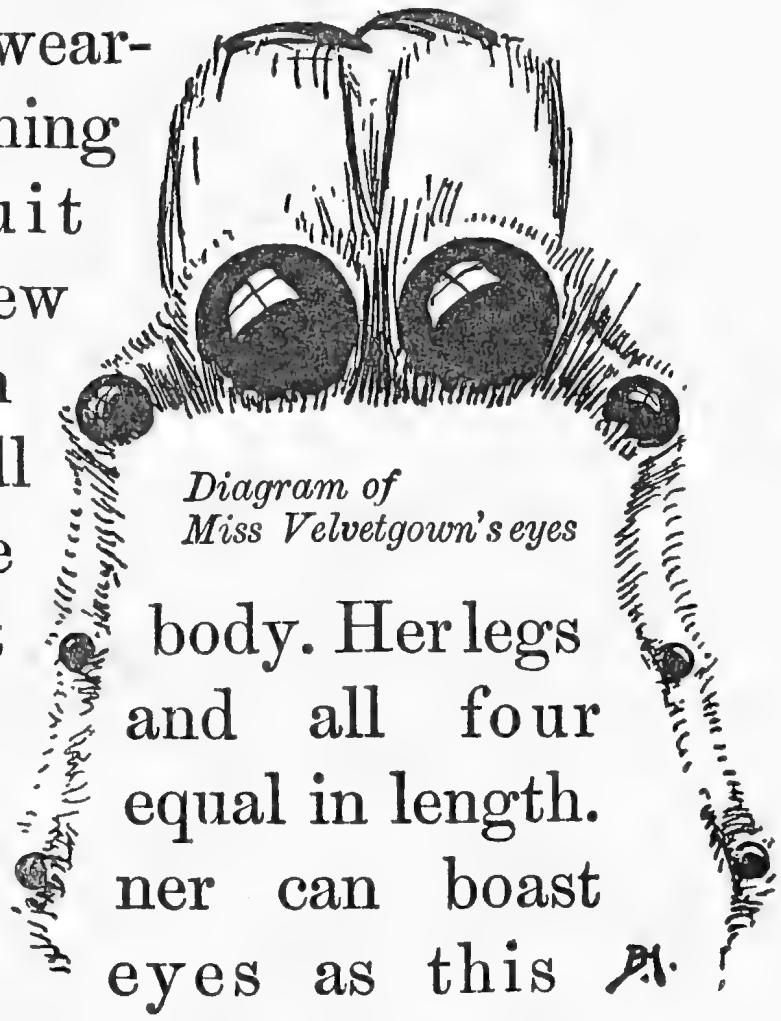


Diagram of Miss Velvetgown's eyes

No other Spinner can boast of as beautiful eyes as this prim little lady. They are arranged as you see in the diagram. The two

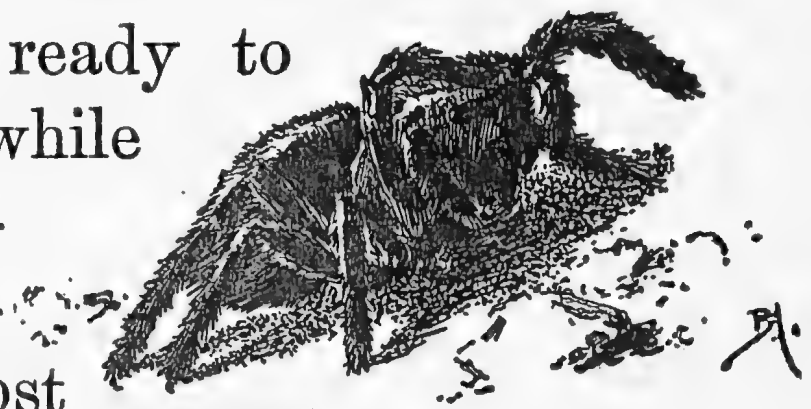
in front just above the mandibles are much larger than the other six. Indeed, of all the eyes that belong to the Spinner family these are the largest and brightest.

While you are admiring Miss Velvet-gown's eyes you cannot fail to see her mandibles shining like two magnificent emeralds. Take her altogether, you will not find among all her family a more attractive, prepossessing little body.

This Spinner does not race away the moment you approach her, as so many of her kindred do, but she meets you with a self-possessed air, and returns your gaze as if she were as curious to find out what you are like, as you are to find out all about her ways and habits.

If, after looking you over, she thinks that you may be bent on mischief, and ought to be frightened away,

she moves a little to one side, raises her head, draws back one of her front feet, as if ready to strike, all the while champing her shining green mandibles in the most threatening manner.



"In the most threatening manner"

Miss Attida depends upon her eyesight to find out things much more than the orb-weavers or tent-makers do. This is necessary in her case, for she is a real hunter. Just as the Indians years ago started out on their expeditions to kill the buffalo and deer for food, so she starts out with her sharp weapons to slay the flies and other insects that may happen to cross her path.

When a fly alights near her, she sits still for a moment, then stealthily creeps a few inches nearer, crouches like a cat ready to spring upon a

mouse, then bounds through the air. There is a smothered buzz from the fly, a strike of the sharp weapons, and the breakfast is won.

Miss Attida's favorite hunting-ground is the top of a board fence. Here she may be found with her sisters any day during the autumn months, walking leisurely about, or jumping gaily from one position to another.

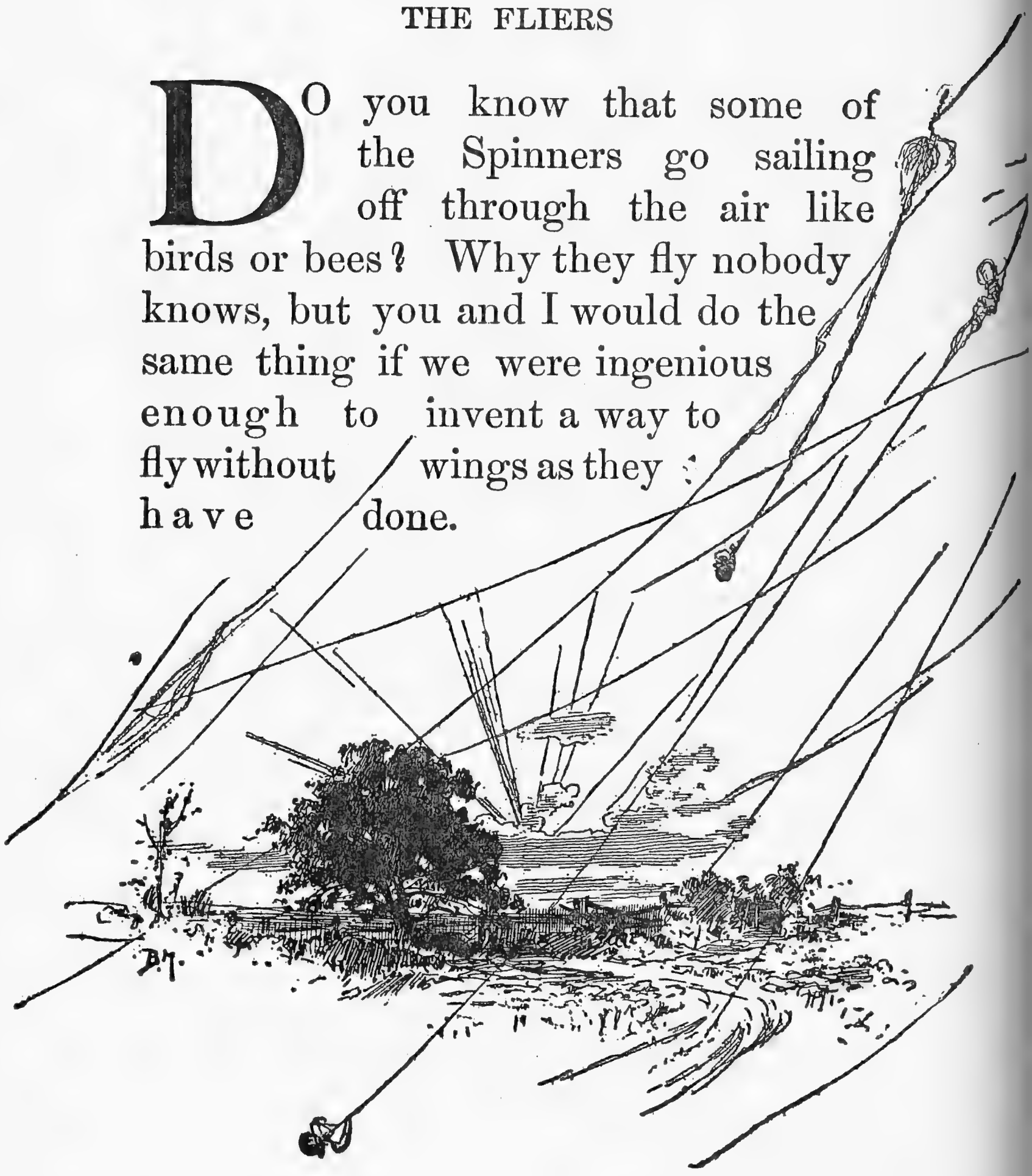
She often jumps just for the fun of it, as schoolboys do. No wonder she likes to do it, she is such an excellent jumper. I have seen her skim through the air from the fence to a rose-bush nearly three feet away. She can jump sidewise as well as forward. When she springs off to one side you half expect to see her come tumbling down to the ground in a heap. But she never does; even if she fails to reach the goal for which she started she does not fall, but calmly swings

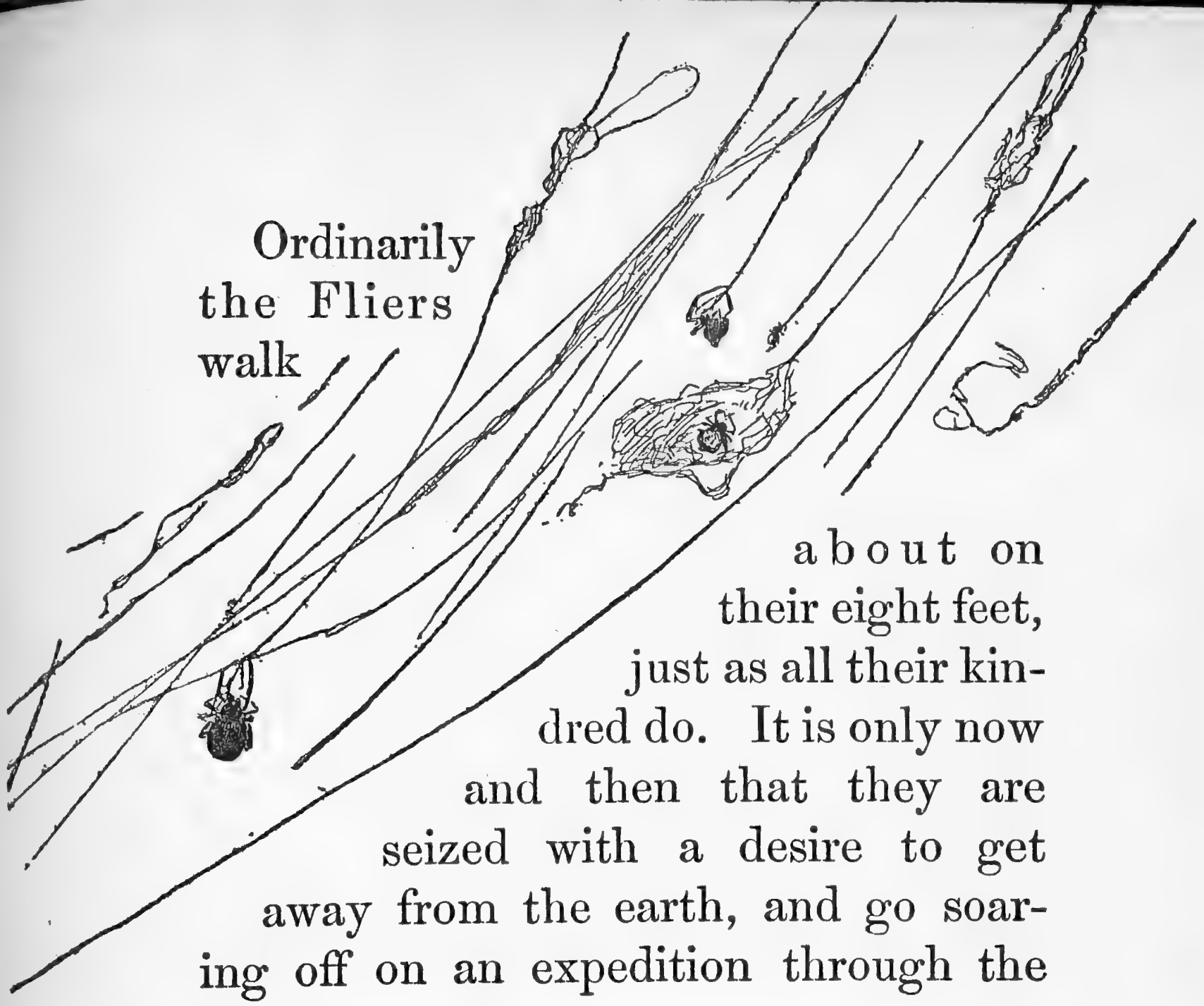
back to the original position. The prudent little lady never ventures to jump without having a silken cord from her spinnerets made fast to the place from which she springs. On this she can easily swing back if she misses her footing. Not only in jumping, but also in walking, she trails after her the delicate, almost invisible thread. Often she will stretch her magic telegraph line almost around the garden, fastening it to the palings as she hops from one to another.

XIII

THE FLIERS

DO you know that some of the Spinners go sailing off through the air like birds or bees? Why they fly nobody knows, but you and I would do the same thing if we were ingenious enough to invent a way to fly without wings as they have done.





Ordinarily the Fliers walk about on their eight feet, just as all their kindred do. It is only now and then that they are seized with a desire to get away from the earth, and go soaring off on an expedition through the air.

A warm day in early spring, or a balmy one in autumn, is the time the Spinners choose to start out on their journey, — just the kind of days that make you long to rush off to the woods to sit on a half-shaded hillside, or to listen to the shuffling music of the brown leaves as you wander leisurely beneath the trees.

The flying seems to be contagious,

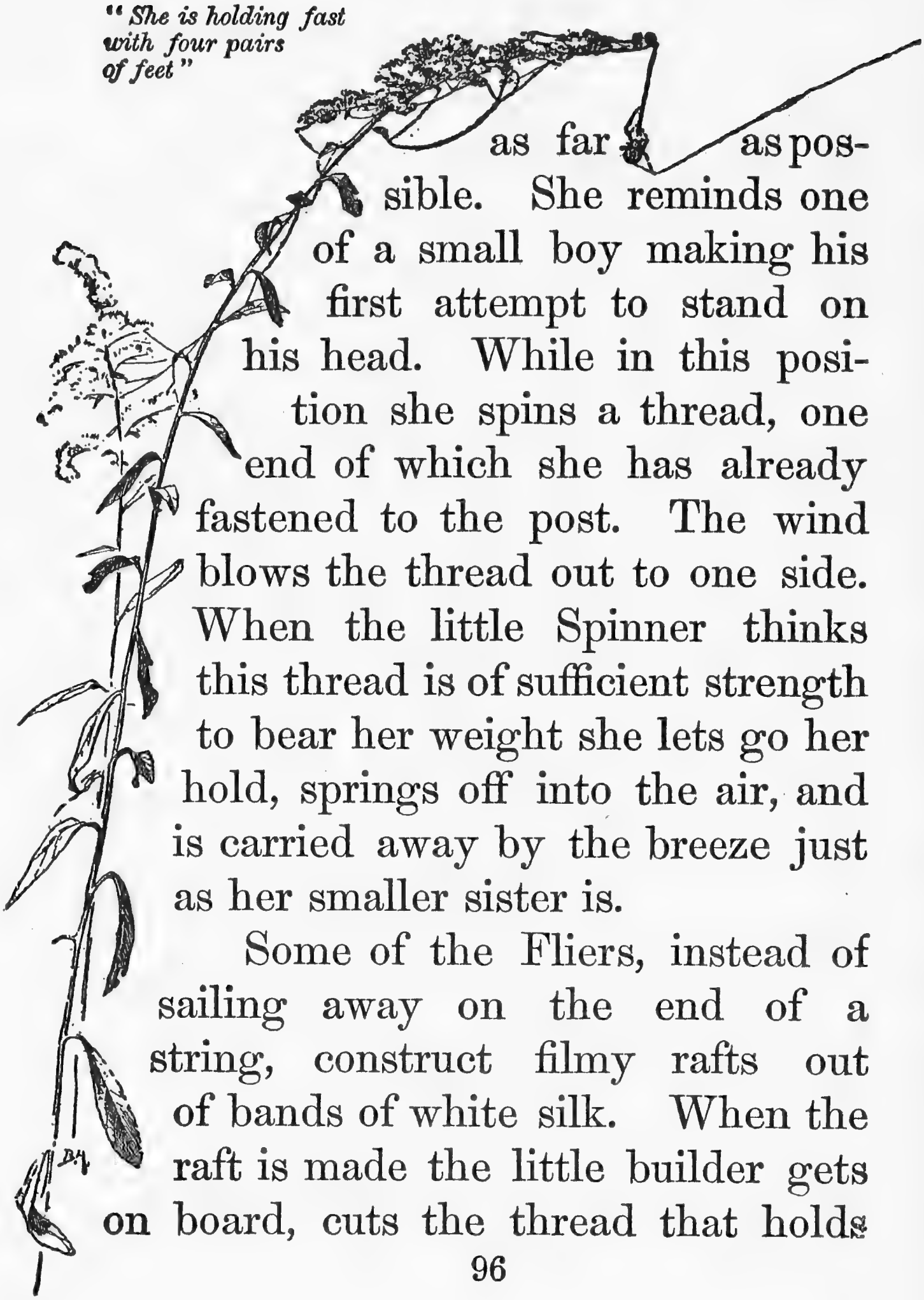
for whenever one Spinner starts out, hundreds are sure to follow, so that the whole air may be filled with their dainty kite-strings stretching in every direction. None of the large Spinners fly, but the young of almost all spiders take at least one jaunt through the air before they settle down to the humdrum life of building homes and setting snares for prey. Spinners that never become very large even when grown up fly whenever they wish to.

It is no easy matter to catch a Flier in the act of starting out on her journey through the air. The first thing that she does when she has made up her mind to go off on a pleasure trip is to climb to the top of a weed or a shrub or a fence post, where the breeze has a good sweep. This first step taken, it depends upon who the Spinner is what she will do next.

If she is a young garden spider or jumper, she will fasten an end of a

thread to the post, and then drop two or three inches, hanging to the other end. She is tossed and whirled about by the wind, but she does not care. She is holding fast with four pairs of feet. At the same time she is sending from her spinnerets a stream of silk. Presently she darts off as if shot from a popgun. She is carried onward by the breeze, while she skilfully lets out more and more string as she flies. If she strikes a tree or any other object she settles down for a moment, fastens her string, then waits once more for a favorable breeze, when away she goes again, a tiny kite, letting out her string as she flies.

If the Flier is one of the small grown-up spiders she uses a different method to get herself started off on her journey. When she has reached the top of the weed or post she does a very funny thing. She stands on tiptoe, her head down, her abdomen stretched upward



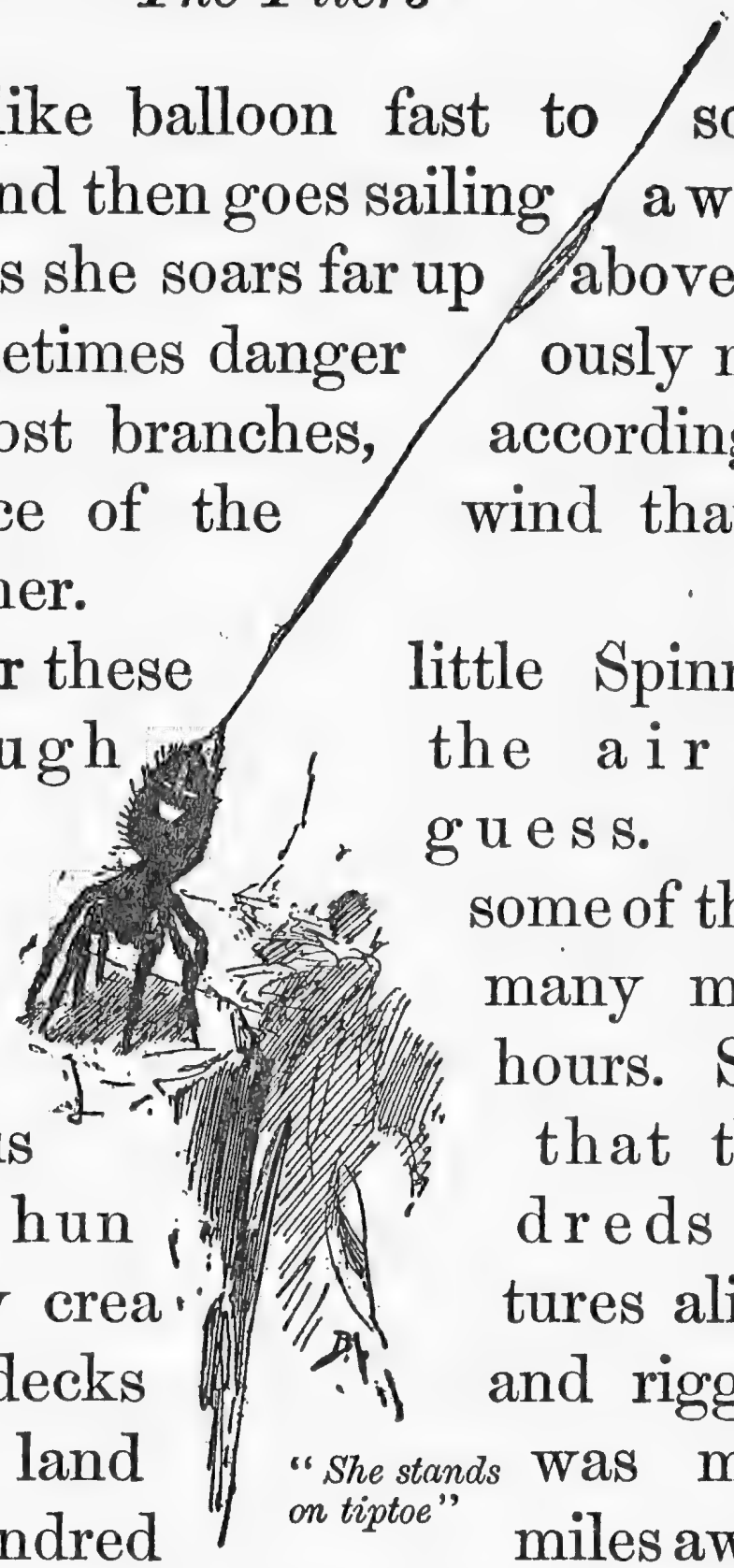
"She is holding fast with four pairs of feet"

as far as possible. She reminds one of a small boy making his first attempt to stand on his head. While in this position she spins a thread, one end of which she has already fastened to the post. The wind blows the thread out to one side. When the little Spinner thinks this thread is of sufficient strength to bear her weight she lets go her hold, springs off into the air, and is carried away by the breeze just as her smaller sister is.

Some of the Fliers, instead of sailing away on the end of a string, construct filmy rafts out of bands of white silk. When the raft is made the little builder gets on board, cuts the thread that holds

the boat-like balloon fast to some support, and then goes sailing away. Sometimes she soars far up above the trees, sometimes dangerously near the topmost branches, according to the caprice of the wind that is carrying her.

How far these little Spinners go through the air is hard to guess. No doubt some of them travel many miles in a few hours. Seamen tell us that they have seen hundreds of these tiny creatures alight on their decks and rigging when all land was more than a hundred miles away.



"She stands on tiptoe"

Why these spiders fly is another puzzling question. In the case of some species it is perhaps a method of migration to new fields where they

hope to obtain a better living. In the case of the young it is their way of leaving the home nest and starting out in life for themselves. On the whole, flying seems to be practised for the pleasure there is in soaring off through the air. It seems to be the Spinner's way of having a good time.

XIV

SPINNERS WHO LIVE IN THE GROUND

WITH Spinners swinging their hammocks in the corners of our houses, tenting on our lawns, building lace palaces in our gardens, and flying through the air, no one will be surprised to learn that some members of this interesting family, like the ancient cave-dwellers, make their homes in the ground.

Some of the ground-spiders have rather crude dwellings. A little hollow, an inch or less in depth, under a dead leaf, is all the home that our common black running spider possesses. Indeed, some of these runners

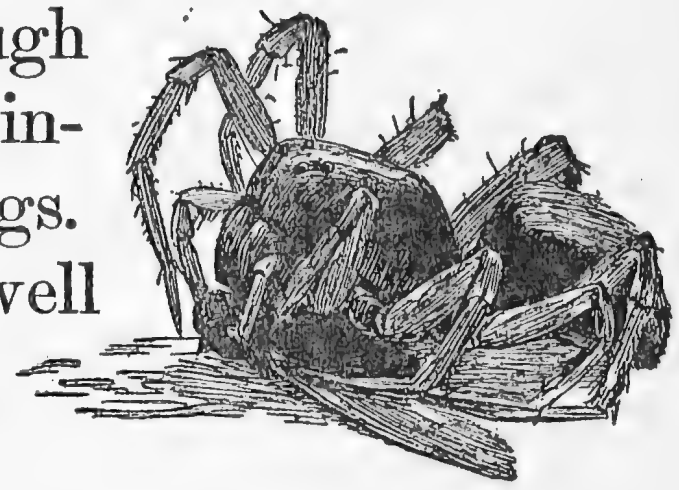
do not take the trouble to dig even a shallow hole, but, having found a crack or crevice under a stone or log, or at the root of a tree, they take possession, line it with a few threads of silk, and contentedly set up their housekeeping in it.

This cave is used only as a place of safety to which the Spinner may retreat in case of danger, or in which she may sleep during the daytime.

"All the home that our common black running spider possesses"

Like the Jumpers, the ground-spiders are hunters. They never set any snares, but capture their prey by main force. They slip quietly from their retreat soon after sunset. In the twilight you may see a dark body rush with

tremendous speed across the path before you. You catch but a glimpse of it, but that glimpse is enough to tell you that it is a Spinner with very long legs. The legs are strong as well as long, so that a beetle or other walking insect has little chance to win in a race with one of these swift runners.



"Capture their prey by main force"

But these dark-robed racers are perhaps the least interesting of all the Spinners who live in the ground.

Some day when you are raking the dead leaves from your yard you spy, down among the grass blades, something new and strange. You stoop down to investigate, and find three or four dead leaves, as many straws and sticks all fastened together so as to form a tube-like passage with an opening at one side. This opening leads

into a channel extending several inches underground. Both tube and channel are lined with silk. While you are examining it, the owner of the home rushes out, is off, and out of sight in an instant.

"You see what a beauty she is"

In that one instant, however, you see what a beauty she is, dressed in a mouse-colored suit of fur, with a few bits of black velvet trimming. It seems to be the fashion among the ground-spiders to dress in fur. No matter how warm it is, you will always find them clad in their heavy winter suits.

This mouse-colored Spinner is one of the largest, as well as one of the handsomest, of the ground-spiders.

She has a near relative who builds a much more elaborate house than she does.

This is the turret-builder. She is not content to make the entrance to her home of leaves and straws and other miscellaneous matter. She collects a number of small round sticks, and out of these builds a tower. She puts her sticks together in much the same way that our grandfathers did when they built their log cabins years and years ago. This skilful builder digs a tunnel under her tower; with the dirt from this she makes a mortar and plasters her tower on the inside. She has already fastened the sticks together with cords of silk. When the plastering is done she covers the wall with a drapery of silk threads. The towers vary in height from a little over an

The Turret

inch to two and one half inches. Often Mrs. Turret-builder sits at the top of her tower keeping a sharp outlook for prey or enemies. If an insect comes near, she darts from her position, grasps it, and carries it off to her tunnel before it knows what has happened.

The ground-spiders we have met thus far all belong to one family called Lycosidæ. But there is another family of ground-spiders which in some respects is more ingenious than even the runners and turret-builders. The best representatives of this family are the Tarantulas and Trap-door Spiders.

In one particular these Spinners differ from all others. You remember that Mrs. Epeira's poison fangs moved from side to side; that is also true of all the other Spinners you have seen. But the poison fangs of the Tarantula and its relatives move up and down

instead of sideways. For this reason they can use their fangs to better advantage in attacking an enemy than any of the other families of spiders.

The home of the Trap-door Spider is found in the sandy soil of California and other Western States. It is made in much the same way that our ground-spiders make their tunnels in our gardens. The inside of the narrow hall is lined with a thick coat of silk. The entrance is skilfully fitted with a door made of closely woven threads and covered on the outside with a layer of soil or sand. The door is hinged at one side with a heavy silk film. Whenever the owner wishes to be considered "not at home" to all callers, she carefully closes her door.

"Sometimes the lady of the house fastens her door open by means of threads"

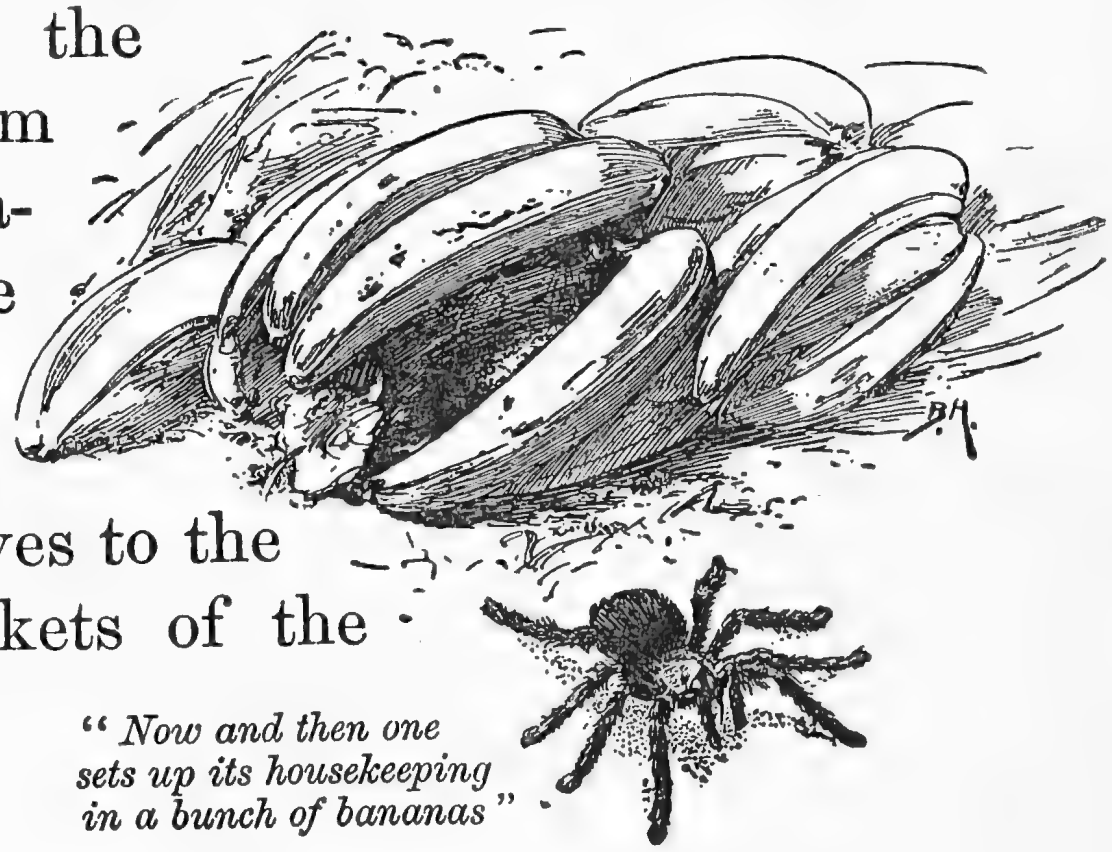
Now this door, when closed, so closely resembles the surrounding soil that you could walk directly over it a dozen times without ever seeing it.

Sometimes the lady of the house fastens her door open by means of threads. Then she sits at the entrance and watches for stray insects. If she is rewarded by seeing an ant or a beetle wandering by she rushes out, captures it, and carries it down into her subterranean dining room, where she feasts upon it at her leisure.

If no insects come near her dwelling, this Spinner, like our black runner, starts out on a hunting expedition, not returning till she has found something to satisfy her hunger.

The Tarantulas make their homes in silk-lined tunnels or in crevices under stones or leaves. Now and then one sets up its housekeeping in a bunch of bananas that has been left

lying on the ground. When this happens Mrs. Tarantula is frequently carried all the way from her native home among the banana groves to the fruit markets of the North.



"Now and then one sets up its housekeeping in a bunch of bananas"

XV

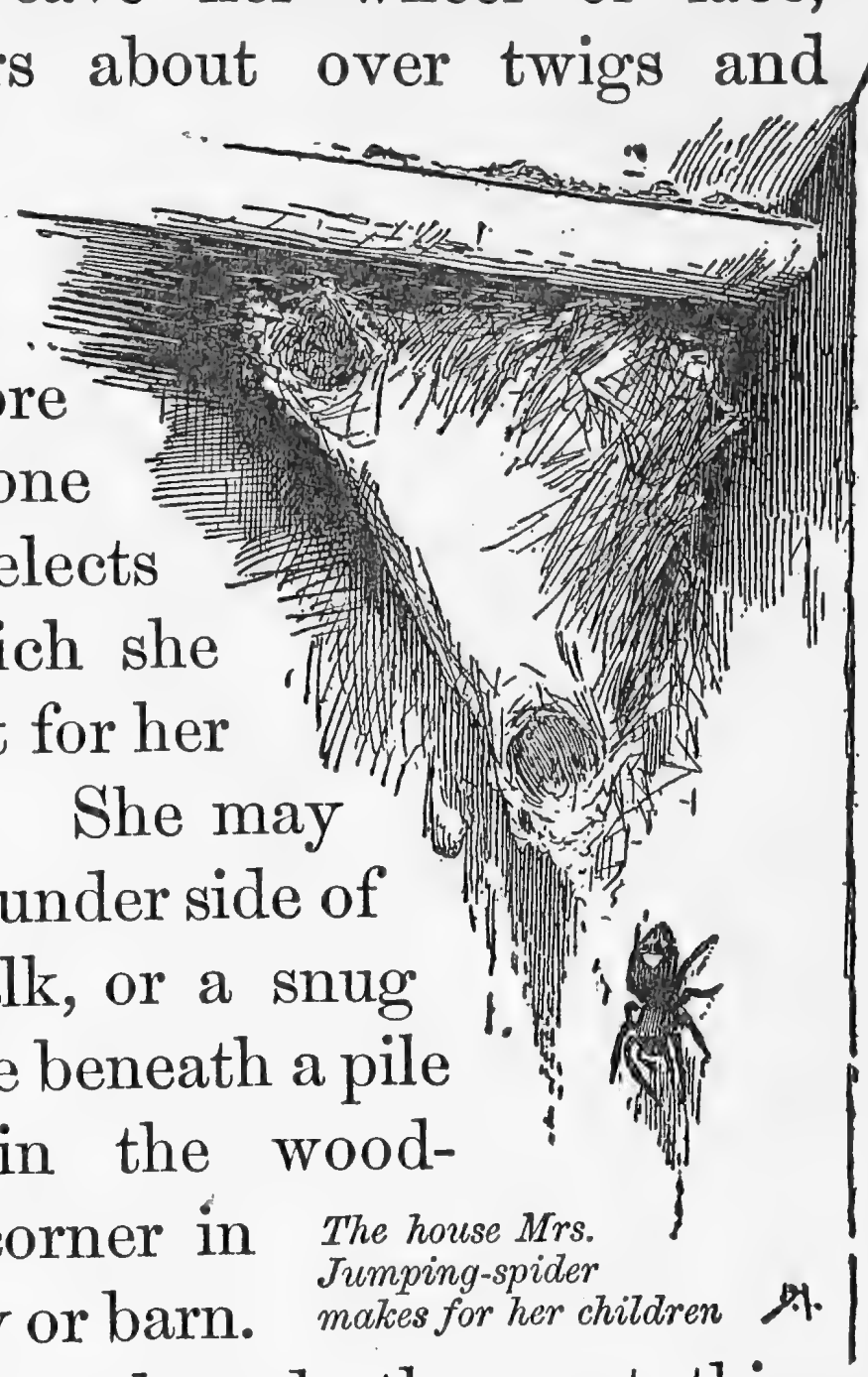
THE BABY SPINNERS

WE have been talking all the while about grown-up Spinners as if there were no babies in the family. But the babies are plentiful enough, I assure you. They all make their first appearance in the form of eggs.

Each mother Spinner has her own notion as to the way the babies should be cared for. Mrs. Epeira's greatest anxiety is to find a safe hidden corner in which to deposit her precious package of eggs.

A night comes in the early autumn when she leaves her bell chamber, and, instead of setting to work as

usual to weave her wheel of lace, she wanders about over twigs and sticks and boards. The night may be more than half gone before she selects a place which she considers fit for her treasures. She may choose the under side of a board-walk, or a snug little crevice beneath a pile of sticks in the wood-yard, or a corner in the granary or barn.



The house Mrs. Jumping-spider makes for her children

The spot selected, the next thing in order is to arrange a soft cushion of white silk upon which to place the tiny orange-colored balls. But the cushion is on the under side of the board; how will this careful mother

manage to place the eggs on it without having every one of them fall down to the ground? She skilfully weaves a meshwork of loops and in these carefully drops the eggs. When they are all in she covers them with a warm blanket, which she tucks in on every side. When this is done she goes away, leaving them to the mercies of Dame Fortune. The eggs hatch during the winter, but the babies stay in their warm cradle until early spring, when they come forth to battle with the world and to build dainty wheel houses with bell chambers attached, just as their mother did the summer before.

You remember that Mrs. Jumping-spider does not build a house, but when she is not searching for food takes possession of any crack or crevice that may offer itself, and lives in that. When babies are to be con-

sidered, even Mrs. Jumper must have a house. You will find her looking for a building place early in June.

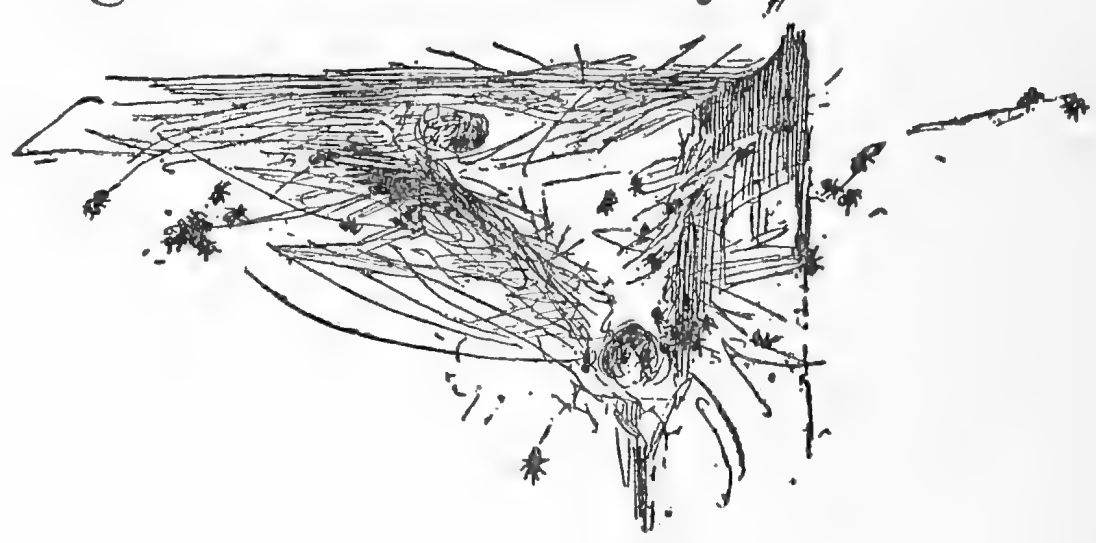
Sometimes she chooses the side of a wall in the barn or coal shed, often the inner surface of loose bark on posts or old logs. Now and then she makes a pocket out of a leaf by stitching its edges fast together and builds her house in that.

The house is a very pretty one, made out of the whitest silk fabric imaginable. It usually measures about an inch and a half in length by an inch in breadth. Mrs. Jumper always has two doors in this dainty little dwelling, so if an enemy enters at one she may escape at the other. Within this house she deposits her eggs in a little cradle which she swings fast to the wall. For the present her hunting expeditions are at an end. She stays at home, carefully watching and

guarding this precious little bundle. Now and then she ventures a short distance away, catches an insect, and hurries back to her charge. This goes on for three weeks, and then the mother's heart is rejoiced to find that the small cradle is full of baby Spinners instead of eggs. For a few days the spiderlings stay in the lace-covered cradle, then they venture out into other parts of the house, but it is more than a week before even the boldest ones find their way through the doors into the world outside. Even now they wander only an inch or two away from the open door. In order that they may be sure to find their way home again, each babe stretches a cord along the path that it has taken, for even at this tender age it has learned to spin a thread just as its mother does.

The babes look much like their

mother, only they wear brown dresses instead of black velvet. For a week or more they ramble about the little white house, then one by one they start out to try their fortunes in the wide world. Many of them perish from one cause or another, but a few live, and by next spring they will be full-grown Jumpers robed in the characteristic velvet gown of their family.



"Even now they wander only an inch or two away from the open door"

XVI

BABY SPINNERS, CONTINUED

MRS. HOUSE-SPIDER does not leave her trestle-work room to search for a hidden corner in which to place her eggs. Instead, she prepares a unique pear-shaped case for her eggs, which she hangs in the upper part of her web. But she does not stop with one; a week passes, and a second case swings beside the first. Another and another is added, until five of these tan-colored balls dangle from the ceiling of Mrs. House-Spider's living-room. Meanwhile, this industrious Spinner places herself just below the balls and sleeps,

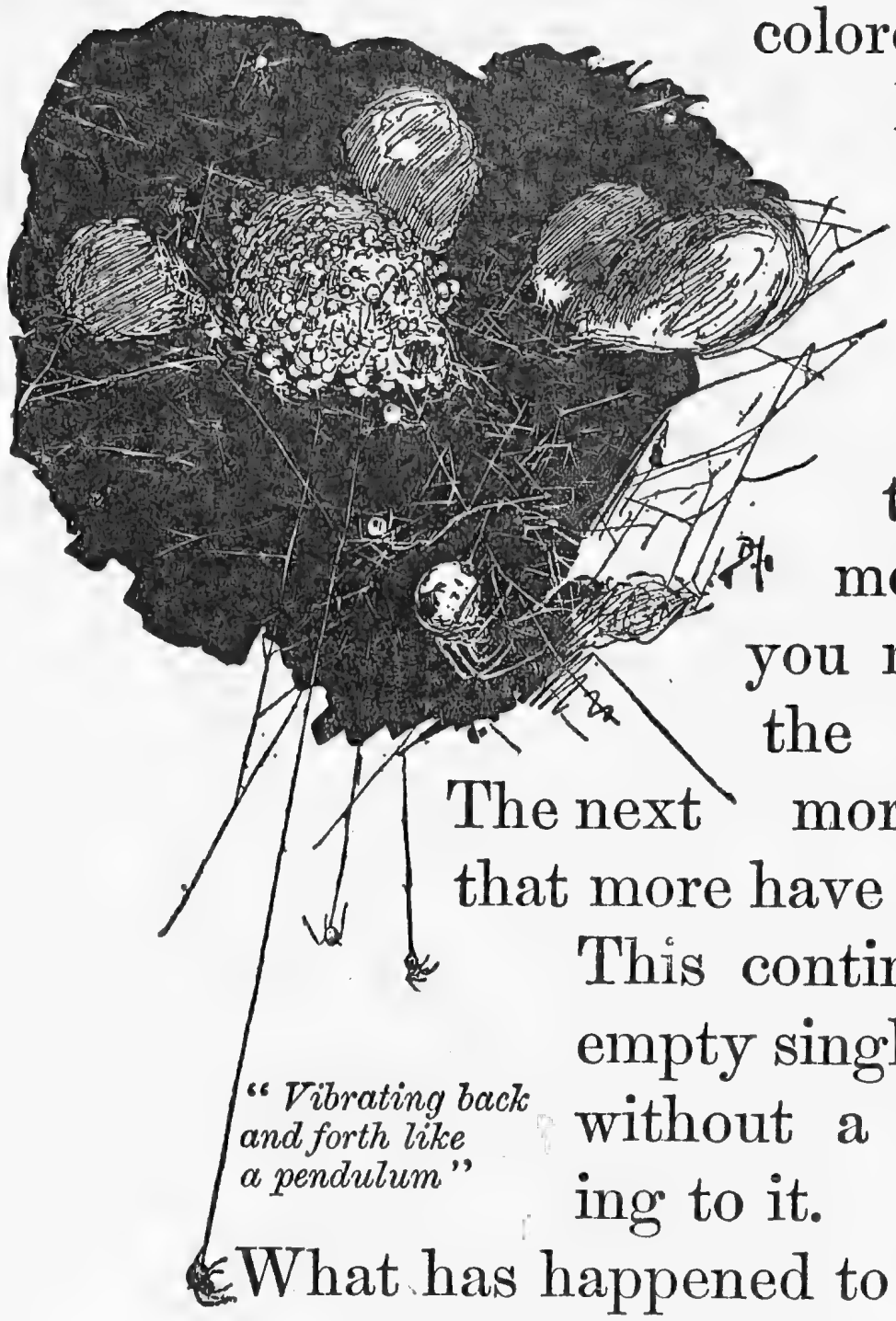
or chews away on a beetle, according to her usual habit.

The eggs hatch in about two weeks, but the babies are shut up within their case and cannot get out. If you wish to see them in this stage of their existence, you must cut a hole in their tan cradle and let them out. Never were there more cunning babes. They look like bits of transparent wax wriggling about on their cream-colored legs. Now and then they turn their faces toward you, and you see their eyes, like tiny garnets set in the wax.

But remember that you have cut their case and let them out before they were ready. If left alone, they change their waxen robes for tan-colored ones before their mother cuts a hole in their cradle and sets them free.

They scramble out and gather like a swarm of bees around their empty cradle, each having a thread fastened

to the web or case. The whole brood looks like a tangle of delicate tan-colored floss.



" Vibrating back and forth like a pendulum "

For a week they cling h e r e, s c a r c e l y m o v i n g, then comes a morning when you miss some of the dainty dots. The next morning shows that more have disappeared. This continues till the empty single case is left without a babe clinging to it.

What has happened to them? You must visit them with your lantern in the night-time to find out, for these baby Spinners make their début into the world in the dark.

When all is ready for the setting out, one little fellow drops two or three inches, hanging at the end of his thread, and vibrating back and forth like a pendulum.

Suddenly he swings off to one side, farther and farther he goes. Your eyes follow him for two or three yards, then he is lost in the darkness. Another soon follows, then another; emboldened by the success of these, half a dozen start at the same instant. Some of the timid ones who have not made up their minds whether they are ready to leave the home-nest or not, amuse themselves by trotting back and forth on the tight-rope bridges made by their flying companions.

In due time even the most timid one goes forth to set up housekeeping for itself, and try its fortune in catching prey.

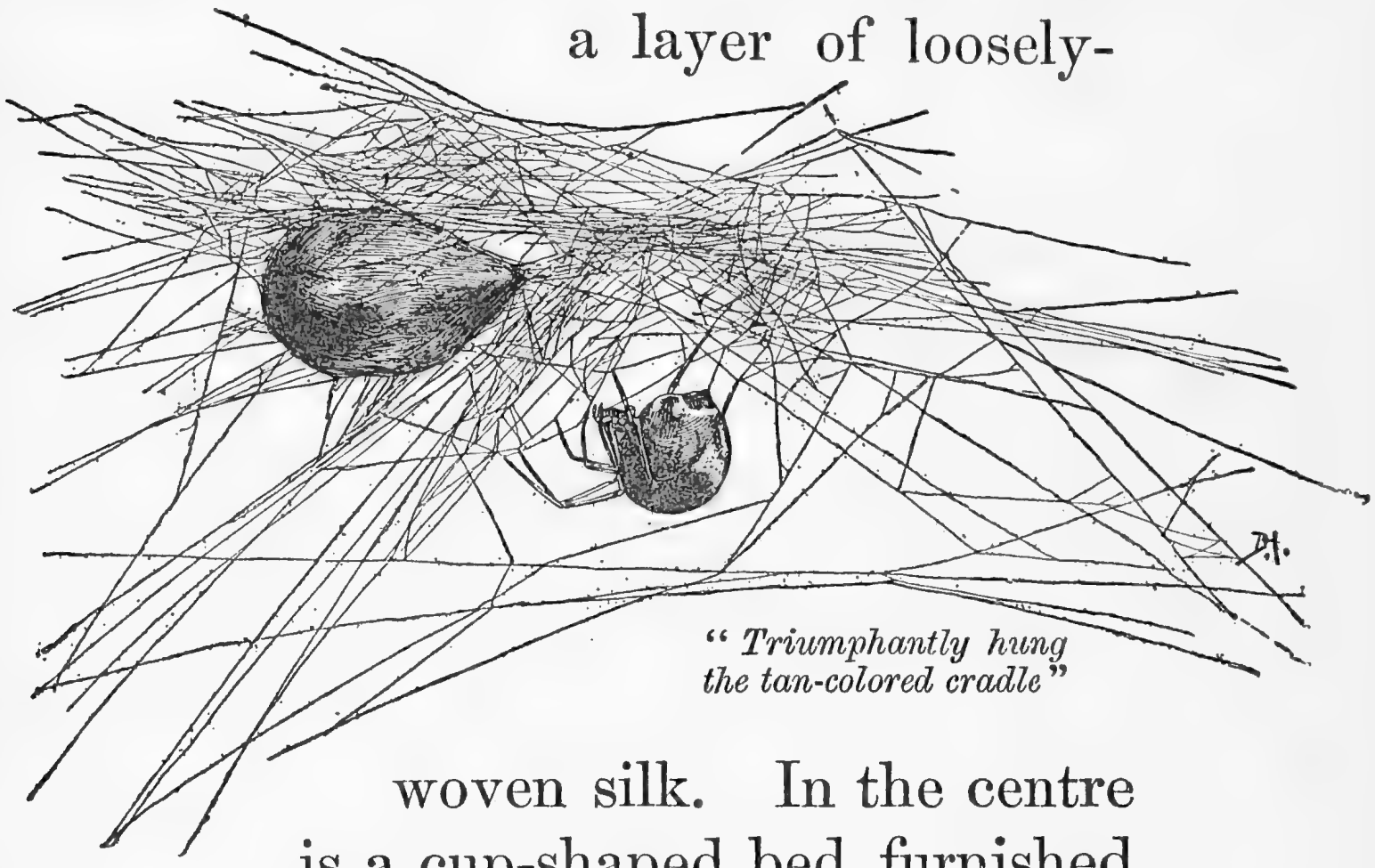
One cradle holds from three to five

hundred little Spinners, so Mrs. House-Spider often has as many as one thousand babies to watch over at one time. None of the Spinner mothers is more faithful than she.

I once placed a house spider with one of her egg-cases in a small cage. The door of the cage was left open one night, and the spider escaped. She did not forget her precious package of eggs, but, fastening it by means of threads to her spinnerets, she carried it with her. I found her the next day behind the bookcase, where she had already made a snug little house, from the ceiling of which triumphantly hung the tan-colored cradle.

The Autumn Spider makes a very elaborate case or cocoon to hold her eggs. It is flask-shaped, with a very large round bowl and a short neck. It is a wonderful piece of workmanship. The outside of the case is made

of a tough, paper-like membrane of a bright lemon color. This is lined with a layer of loosely-



" Triumphantly hung the tan-colored cradle"

woven silk. In the centre is a cup-shaped bed, furnished with the softest of blankets and an old-fashioned canopy of silk hanging overhead. The eggs are placed in the warm bed. When the cocoon is finished, the spider hangs it up in some out-of-the-way corner in a building or wood-pile and then goes away, to trouble no more about it.

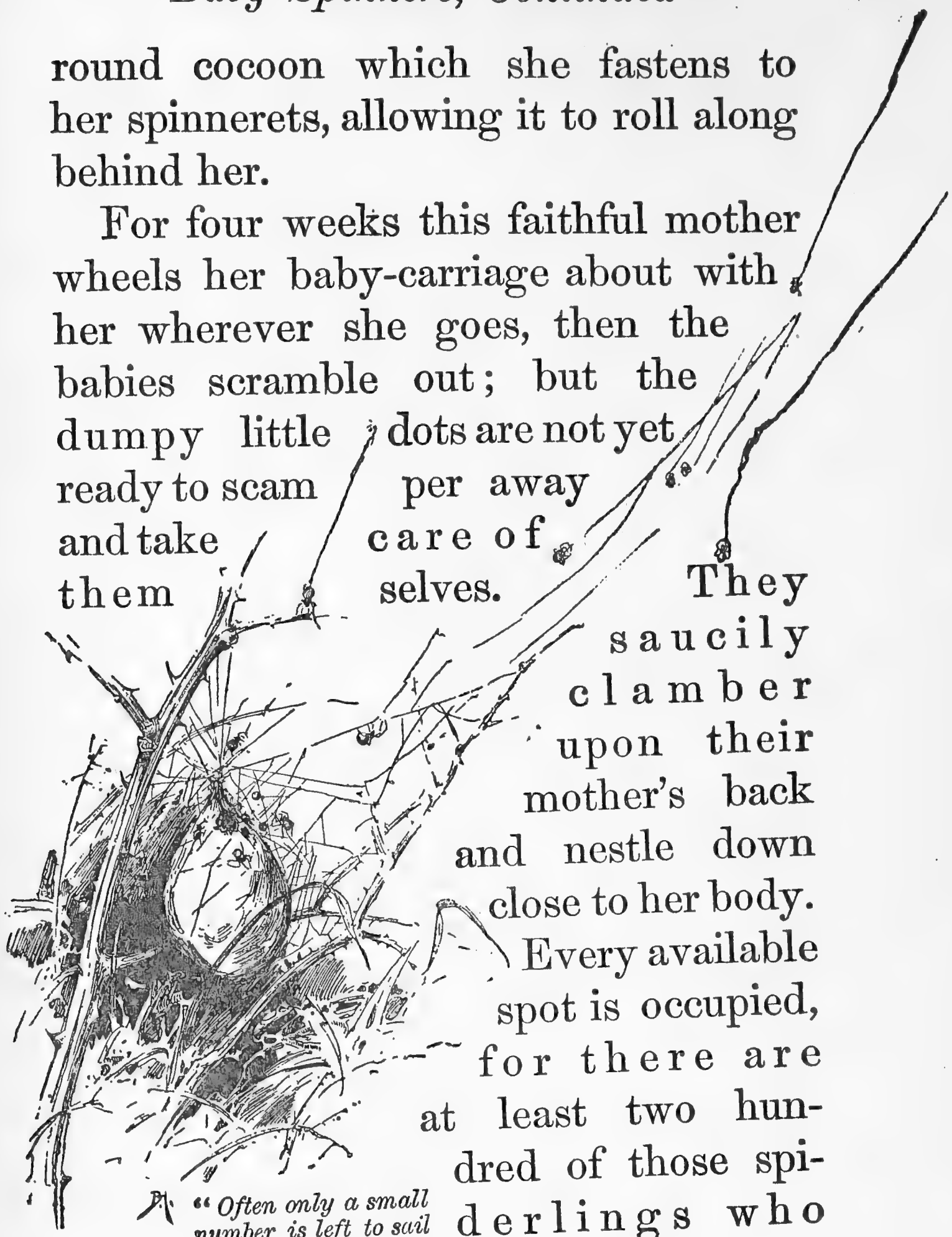
This is done in the fall. The eggs hatch during the winter; but the babes remain snug and warm till the spring days invite them out into the sunshine. They come out through a small hole near the top of the flask, and fly away. The numerous spider-webs that we see floating in the air in early spring frequently belong to these young Fliers.

Sometimes these little spiders do a very cruel thing. While they are shut up in their cocoons, during the long, cold weeks of winter, they grow hungry, and the strongest ones eat their weaker brothers and sisters. Often only a small number is left to sail away in the spring.

Ground Spiders use different methods of caring for their children. Our common black runner does not trust her eggs in any cosy nook or corner; but she places them in a

round cocoon which she fastens to her spinnerets, allowing it to roll along behind her.

For four weeks this faithful mother wheels her baby-carriage about with her wherever she goes, then the babies scramble out; but the dumpy little dots are not yet ready to scamper away and take care of themselves. They saucily clamber upon their mother's back and nestle down close to her body. Every available spot is occupied, for there are at least two hundred of those spiderlings who



"Often only a small number is left to sail away in the spring"

expect the mother to carry them about.

For a week or ten days they remain on this novel horse, then one by one they drop off, spin a thread, and go sailing away to care for themselves.

"Our common black runner does not trust her eggs in any cosy nook or corner"

The Ground Spiders that dig tunnels place their eggs in these underground dwellings. Here the young spiders spend the first month or six weeks of their lives, when they wander off to try their skill digging tunnels in the ground.

Tent-makers, both the Grass Spiders and those that live in our houses, make a thin, white cocoon for their eggs, which they hide away in some warm corner. No place suits them as well as a coat or other garment which is hanging where they may slip into its folds, deposit their eggs, and

hurry away again without being seen. They probably never know how rudely their pretty white pack of eggs is snatched from its warm quarters and utterly destroyed.

XVII

THE GENTLEMEN OF THE FAMILY

THERE is not a great deal to be said about the gentlemen of the Spinner family. As a rule, they are insignificant fellows, and make no pretension to strength and chivalry, as so many husbands and brothers in other families love to do.

In the first place, many of them are mere dwarfs by the side of their wives and sisters, so they could not be very chivalrous, even if they were so disposed. In their dress some of them are very modest, wearing dull, inconspicuous colors. Others, however, dress

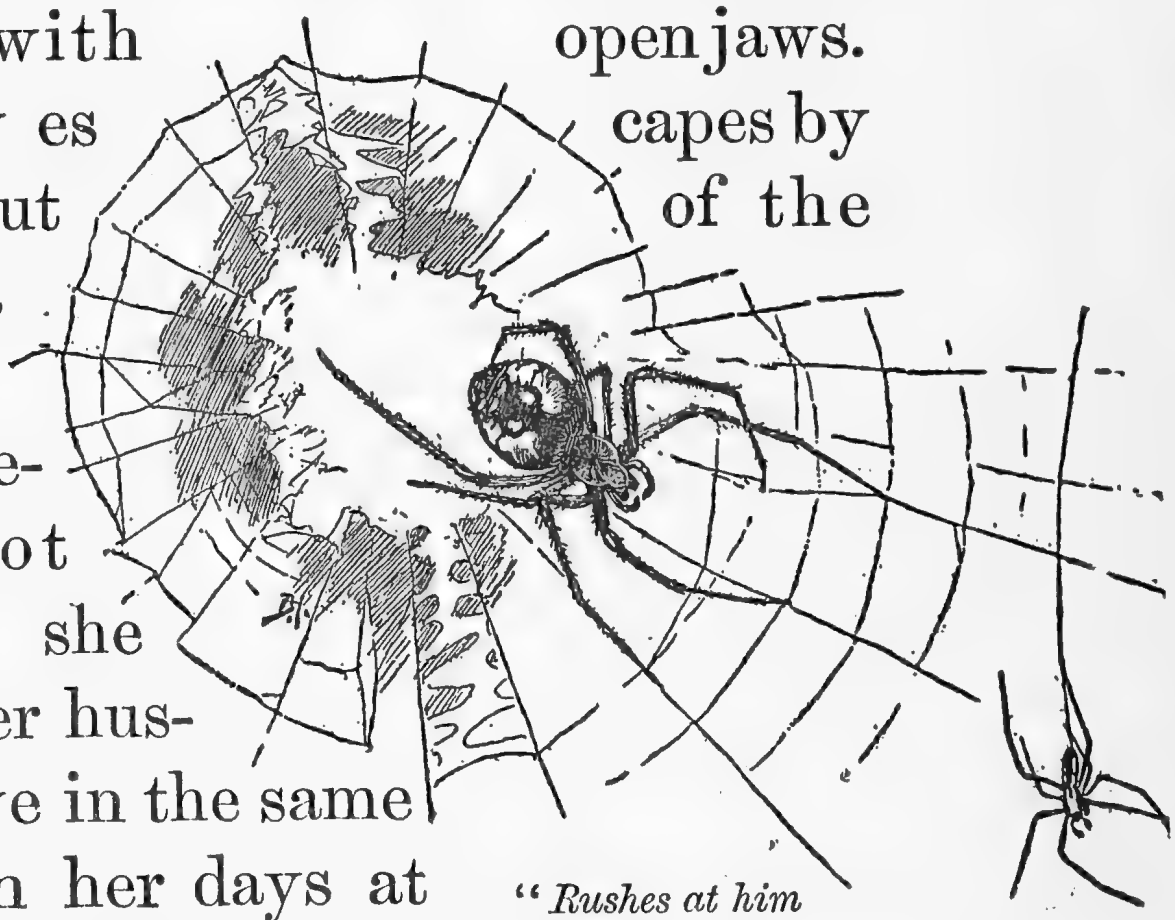
in brilliant-colored garments, as if hoping to make up for their diminutive size with gay colors. They have the same shape as their sisters, with the eight legs and the spinnerets. One set of appendages, however, differs from those of the females. You remember that all the Spinners have a pair of foot-like appendages near the mouth, called palps. The palps of the female end with a slender-pointed segment. Now this last segment of the male's palp is round and thick, resembling a knob. Whenever you meet a Spinner with knobbed palps, you may know it is one of the gentlemen of the family.

Some of the males build their own homes, catch their own prey, and for the most part live their lives in solitude. Others prefer to have the females do the work of building, so they slyly take possession of a corner of the house when it is completed, and watch

their chance to nab an insect. At other times they enter the homes of the females, not to catch prey, but as visitors. Their visits do not always turn out to be pleasant affairs. Indeed the Lady Spinners often regard the entrance of a male into their homes as an unpardonable intrusion. Not only will they refuse a welcome, but will fly at the intruder in a fury, and, unless he is spry enough to get out of the way, he may pay for his rashness with his life.

Of all the Spinners that I am well acquainted with, I think the Autumn Spider treats her male friends with less respect than any of her sisters. If you keep your eyes open you will find, some summer morning, a small spider with slender body hanging in the upper parts of Mrs. Autumn Spider's web. It is Mr. Spinner come to make a call. The lady of the house clings quietly to

her zigzag staircase at the centre. She is fully ten times his size, and you cannot much blame her for turning up her nose at this diminutive lover. If he ventures near her, she loses her self-possession in an instant, and rushes at him with open jaws. He usually escapes by swinging out of the web on a thread. Mrs. House-Spider is not so fierce; she permits her husband to live in the same house with her days at a time. She has a queer habit of standing still and shaking the web, by pulling certain threads with her feet, the moment he enters. Whether this is intended as a greeting, or as a warning, I do not know. At any



"Rushes at him with open jaws"

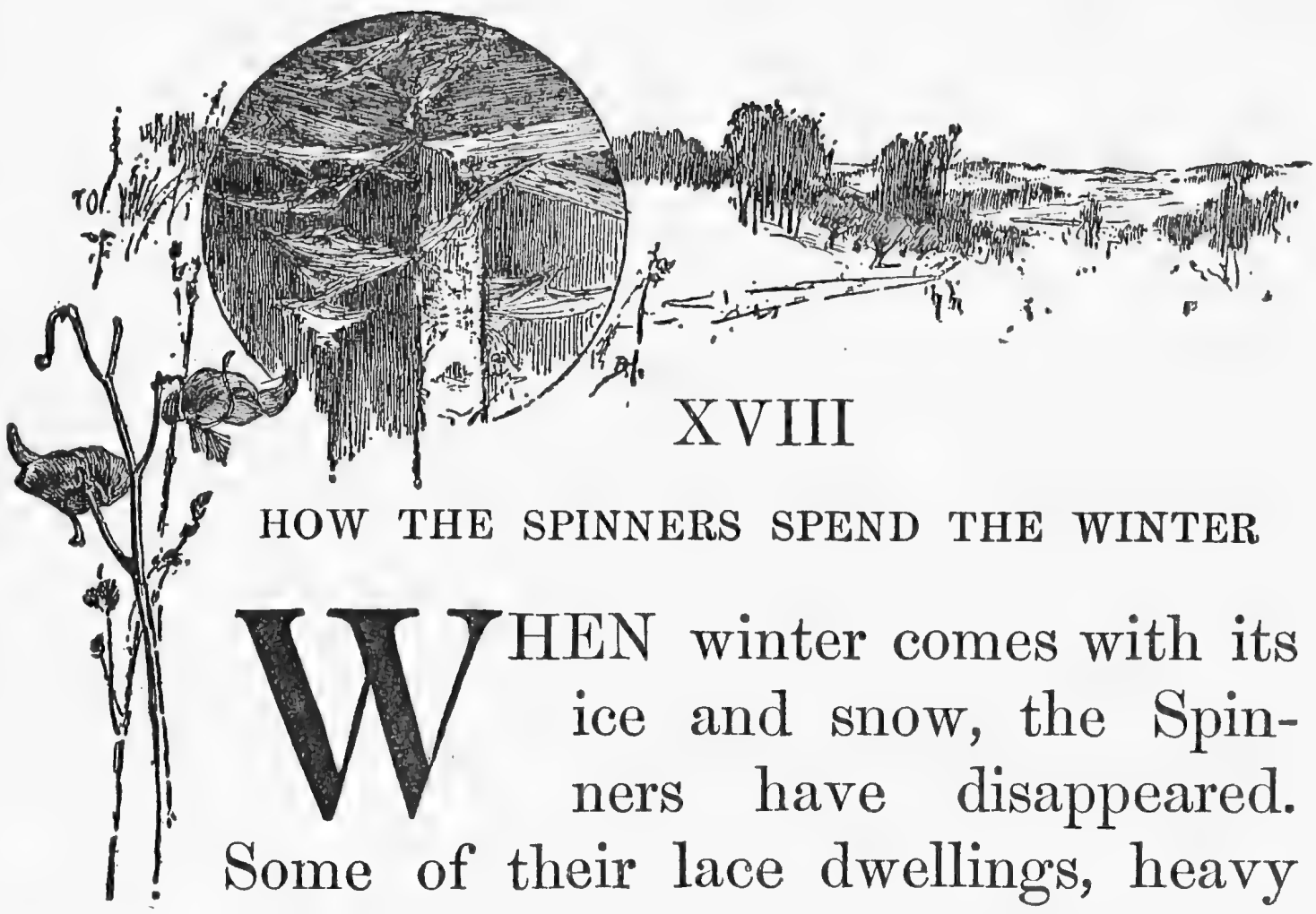
rate she tolerates his presence without showing any disposition to chase him away.

Among the Tent-makers, the males are larger than the females; for this reason, they are not so cautious as their dwarf-like brothers, but visit the tents of the females whenever they please, without any fear of coming away with two or three legs fewer than they had when they entered.

But we must not think that all the Lady Spinners are so unlovable. There is at least one beautiful exception, and no doubt, when we have learned more about the domestic ways of the Spinners, we shall find many others.

One of the tunnel diggers, sometimes called the Tiger Spider, has a real home life. Within the silk-walled tunnel Mr. and Mrs. Spinner live together in peace and harmony sharing their

prey with each other. Here they rear their young, who scamper about in the home until old enough to start out in life for themselves.



XVIII

HOW THE SPINNERS SPEND THE WINTER

WHEN winter comes with its ice and snow, the Spinners have disappeared. Some of their lace dwellings, heavy with dust, may still be seen dangling from the corners of sheds and other buildings, but the owners are gone. You half suspect that they have all packed up their belongings and gone South for the winter.

The truth is, that many of them died of old age before the winter fairly began; for the lifetime of some Spinners is not more than a year. This is true of most of the orb-weavers, including Mrs. Epeira and

the Autumn Spider. But all the Spinners do not die in the fall; many live to be three or even four years old. What can they do to tide over the cold, freezing weather? It is useless for them to spend time and labor in weaving silken snares to catch prey, or building pretty dining-halls in which to feast, for there is no prey to catch, nor insects to feast upon.

There are but two things they can do and live. They must migrate to a warmer climate, as birds do, or roll up in a ball and sleep, like the bears.

It is a question whether any of the Spinners migrate. Perhaps some of the Fliers sail away to the south-land, but nobody feels quite certain that they do.

Those that stay here adopt the other alternative; that is, they search out a quiet, cosy corner and go to sleep.

The Jumpers make for themselves dainty little homes, much like those

they prepare for their children in the summer-time, only they are smaller and have thicker walls. In these they cuddle down at the beginning of cold weather, usually in November, and do not come forth again till the warmth of the spring sunshine warns them that it is time to waken up.

If you are at all inquisitive concerning Spinners' ways, you may find, some day in the middle of winter, when you are prying around, a small gray ball under a piece of loose bark. Tear the ball to pieces, and you find tucked away in the centre, surrounded by layer after layer of silk, a half-grown Jumper in a dainty, gray gown. It is too bad to awaken her at such an untimely season, but no doubt she will forgive you if you tuck her bed-clothes around her again, and put her back where you found her.

The Tent-makers break camp at the

first approach of winter. But they do not fold up their tents and put them away for future use, as you do when you break camp. Leaving their homes to be torn to pieces by the winds or crushed by a weight of snow, they scuttle off to find a warm nook in which to take their winter nap. A wood-pile with a good supply of chips is greatly to their liking. Some of the more fastidious among them enter our homes and try to find winter quarters in our wardrobes and closets. Have you never taken down a cloak or dress that you have not worn for some time, to find that a little Spinner has crept into a warm fold, wrapped her soft blanket about her, and settled down for a long sleep? Poor little thing, she finds herself rudely awakened, and has to scuttle off as fast as her eight legs can carry her, in order to save her life.

The Ground Spiders spend the winter almost exactly as their friends the Tent-makers do, with this exception: many of them slip into a crevice and go to sleep, without taking the trouble to weave a blanket with which to cover up. Those that live in tunnels in the ground usually spend the winter in these underground chambers. A few dig new holes into which they nestle down to sleep.

Mrs. House-Spider is really the greatest stay-at-home of all the Spinners. You remember that during the entire summer she hung, back downward, in her wonderful trestlework house. Here, too, she swung her dainty cradles and reared her thousand and one children. And now that winter has come, and all the cradles except one or two are empty, she draws her feet up close to her body, and hangs in the selfsame place, sleep-

ing the days and weeks away. If you disturb her, she lazily climbs a step or two higher in the trestle-walled room, and immediately drops to sleep again.

At the earliest touch of spring, the Spinners are awake, and soon begin bustling about in search of locations for their summer homes. Not many of them begin to build, however, until the latter part of April or the first of May.

Now and then a warm sunshiny day in the middle of winter tricks the Spinners into thinking that spring has arrived. They rush out to find a rather cool reception. You may often see these deluded little creatures creeping around over the snow, and finally returning, chilled and hungry, to their winter quarters to finish their naps.

XIX

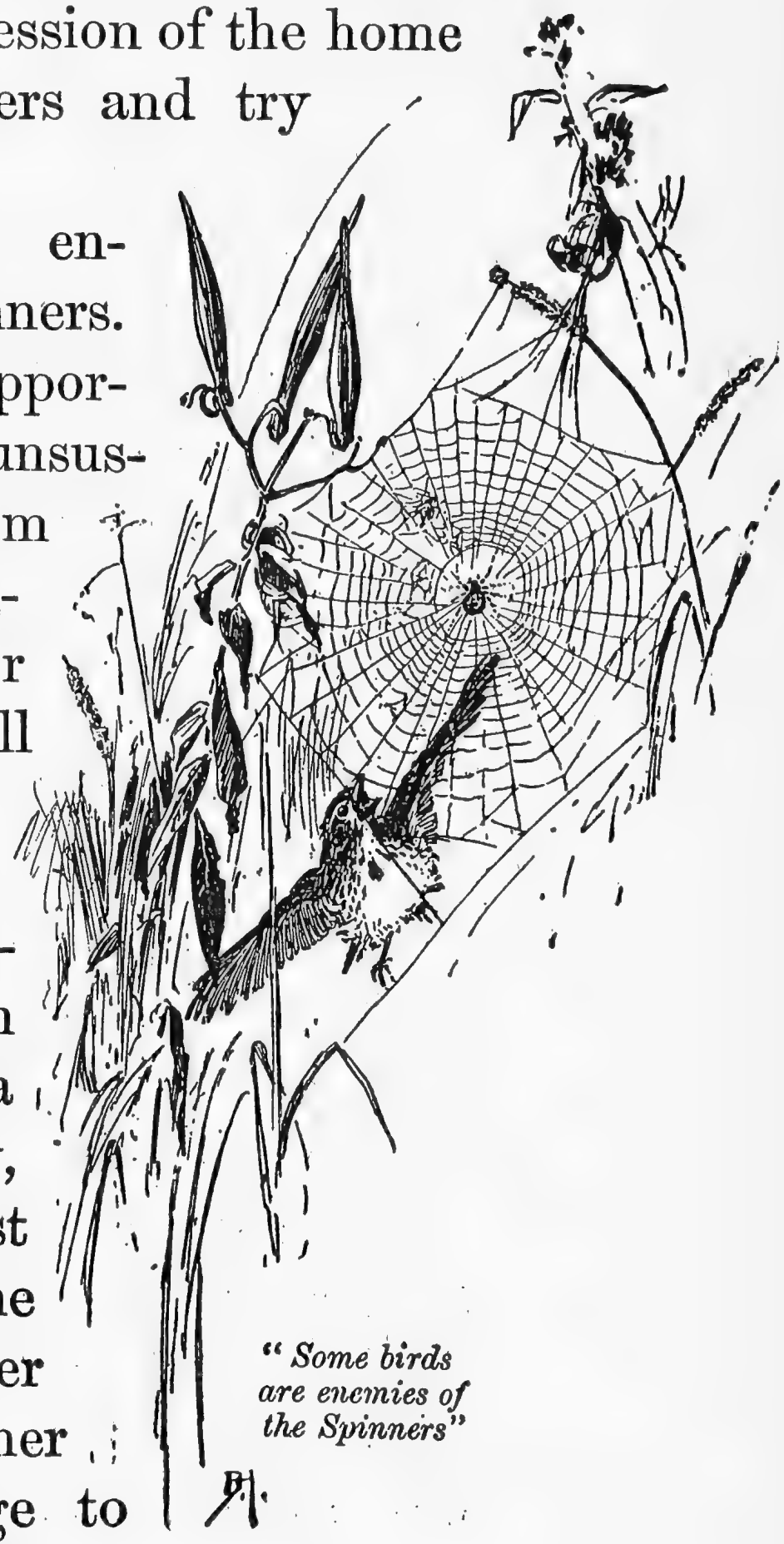
THE SPINNERS' ENEMIES, AND HOW THEY DEFEND THEMSELVES

LIKE all other living things in the world, the Spinners have their share of trouble. They have hardships to encounter and enemies to meet. One thing that they must struggle against is hunger. Sometimes it happens that night after night and day after day passes and no insect enters the carefully prepared snare. The hungry Spinner builds again and again, selecting new locations, and yet without any better success. A time comes when she can build no more. The secretion which forms the silk is all gone, and she has eaten no food to furnish a new supply. There is noth-

ing left for her now but to die, or stealthily take possession of the home of one of her sisters and try her luck there.

Some birds are enemies of the Spinners. They watch every opportunity to snatch an unsuspecting Spinner from her web to swallow her at once, or carry her away to fill the open mouth of a hungry nestling.

Spinners are enemies of their own kindred. It is not a very pleasing story, but the truth must be told. For some reason no Spinner will ever meet another without a challenge to



"Some birds are enemies of the Spinners"

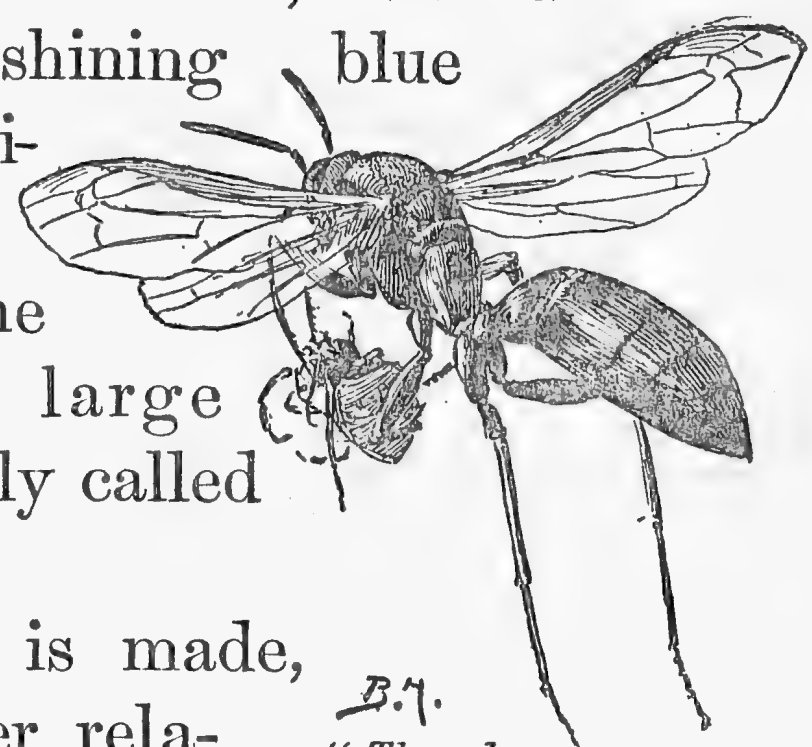
battle. The combat is always a deadly one, neither giving up until one lies dead at the enemy's feet.

Some Spinners of different species often build their webs close together, one hoping to catch the other unawares and make a meal of her.

Certain wasps must be placed in the list of Spinners' enemies. Our common mud-dauber, who builds her mud house on the ceilings of barns and other buildings, is a pronounced foe of the Spinner family. When she has finished one of her arched rooms she deposits an egg in it, and then starts out to hunt spiders. A small green crab-spider, a resident of our gardens, is one of her favorites. When she has caught the spider she stings it, thus rendering it helpless, then she carries it off and places it in the cell with the egg. She does this half a dozen times, and finally closes the cell

with a ball of mud. The imprisoned spiders furnish a rich feast for the young wasp which hatches from the egg.

In California there is a large wasp known as the tarantula-killer, a beautiful creature with a shining blue body. She provisions her cell, which is made in the ground, with one large ground-spider, falsely called a tarantula.

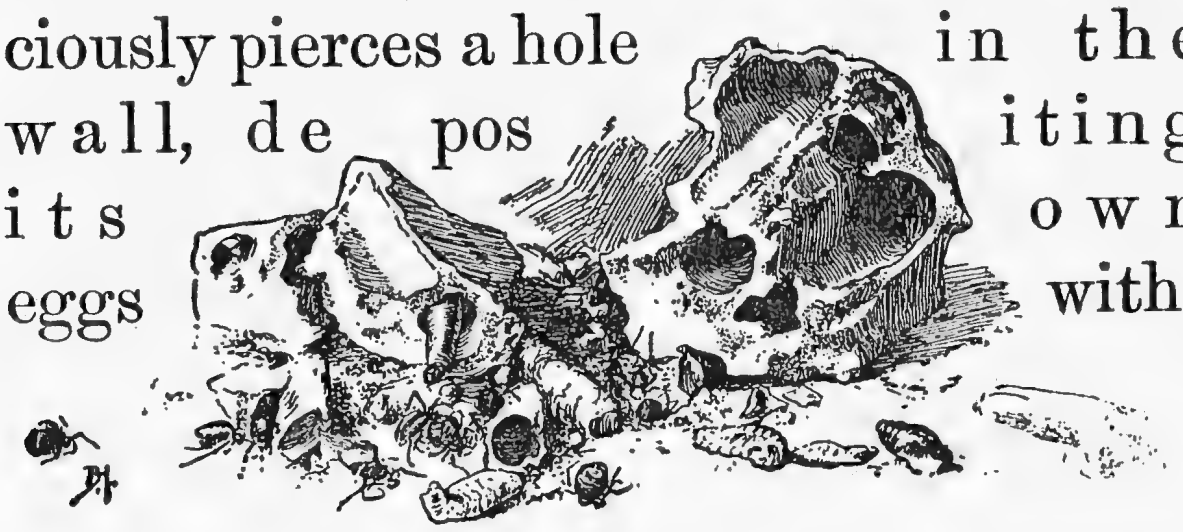


"Then she carries it off"

When her cell is made, she, like her smaller relative, starts out in search of a spider. When she finds the large Spinner, a terrible battle always takes place, in which the claws and poison-fang of the spider are pitted against the sting of the wasp. Sometimes the spider is victorious, but more often the sting of the wasp prevails, and the

spider is borne away to provide many dinners for the baby wasp.

A small ichneumon-fly is another enemy of the Spinners. It finds a cocoon in which the spider eggs have been carefully stowed away, and maliciously pierces a hole in the wall, depositing its own eggs with-



"Larvæ which begin industriously to devour the eggs of the spider"

in. In a few days these eggs hatch into tiny worm-like larvæ, which begin industriously to devour the eggs of the spider. They do not stop until every egg is eaten.

People, too, must be counted with the Spinner's foes. The tidy housewife does not care to have her rooms adorned with the silken draperies of

these tiny weavers, so the brooms and brushes ruthlessly tear down the homes, and as ruthlessly crush out the lives of the little owners at every opportunity.

How to defend themselves against all these enemies is a problem that the Spinners are trying forever to solve. For such small creatures they have succeeded wonderfully in solving their problem.

In the first place, they have learned to do their work during the night, when most of their enemies are fast asleep. Then some of them have become wonderful strategists, which is another mark of wisdom. You have already seen how the hunchbacks and their friends protect themselves by imitating balls of dirt, bits of straw, fungi, and other things.

Almost all spiders have learned the tricks that Seton Thompson tells us

so many of the four-footed animals have learned, that is, to lie low and appear a part of the object upon which they lie. I have seen a garden spider that was accidentally knocked out of her bell chamber lie perfectly still as if dead for more than half an hour.

Many spiders are protected by their colors; the ground-spiders wear dull shades resembling the soil and sand on which they live. A sister of the garden spider, who lives in the woods, stretches her home among the dead branches of shrubs, tucking herself away during the day somewhere about the dead twigs; and so closely does she resemble in color the dry branches that it is impossible to spy her out.

A comical little crab-spider that lives on the golden-rod, dresses in a bright green gown until the constellation of yellow flowers appears on the plant, when it changes to the same

bright yellow. So well does the color protect it, as it nestles down among the flowers, that you may be looking directly at it and never see it, if it is prudent enough to "lie low." Its protective coloration serves it another good turn, for the insects that come to the golden rod to feast on the pollen actually step into the very jaws of the little spinner before they are aware of its presence.

Mrs. Autumn-Spider, who, you remember, dresses in black with yellow stripes, finds some protection in those yellow stripes. Yellow seems to be the danger flag in the world of insects. Whenever you see insects flaunting the yellow stripes or bars, you feel instinctively that they are intended as a warning to keep at a safe distance. It is not hard to account for this feeling, for the bees and other stinging insects all display an abundance of

yellow coloring. Now, while spiders are not true insects, some of them have adopted this terrifying color to ward off enemies. The scheme works well; few people will dare to touch the harmless Autumn Spider, believing it to be very poisonous. Indeed in some localities it is known as the "poison spider."

The poison-fangs are of little value to the Spinners in defending themselves, except when the enemy is another spinner or an insect with whom they can contend in a hand to hand battle.

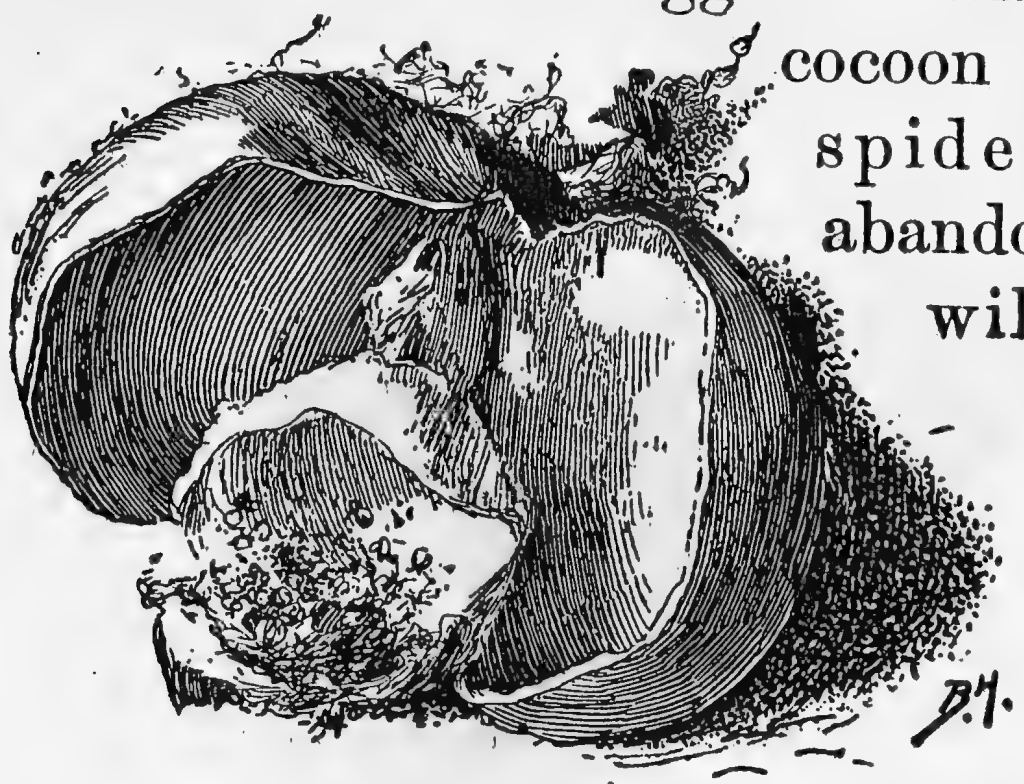
XX

GROWING, BREATHING, AND OTHER THINGS

SPINNERS grow, of course, but they do not grow a little every day as kittens and birds do. Instead they grow by starts and spurts. There is a good reason for this. The outside covering of their bodies is hard and tough. It is the hardest part of their bodies, for it is really all the skeleton that they have. Now this skeleton does not grow, and it is too hard to stretch; so when the Spinner has grown as big as it can inside this covering, there is nothing to do but cast it off and get a new one.

That is just what is done. The babies are only a few days old when

they change their dresses the first time. These baby gowns are always smooth and transparent, and are left within the egg cocoon. Open any cocoon which the spiderlings have abandoned, and you will find great clusters of these dainty cast-off specks of dresses. The second suits are usually a trifle darker in color, and always have a few hairs scattered over the surface. Nothing is more interesting than to watch a Spinner casting off her old suit and getting a new one. But if you intend to watch the process you must light up your lantern again, for most Spinners perform this feat under cover of the darkness.



"Dainty cast-off specks of dresses"

The Spinners that do not make a wheel-house select a crack, or crevice where they may hide and cast their skin, or moult, out of reach of prying eyes. The Jumpers, after their usual fashion when something special is to be done, build their small silk-walled rooms, in which they creep out of their old gowns. The orb-weavers are not so particular about getting out of sight. Whenever one of these feels the need of a new suit she drops from her web and hangs head downward by a short thread fastened to her spinnerets. For a few minutes she dangles there, looking exceedingly uncomfortable, then the skin of the cephalo-thorax begins to split all the way around close to the first joints of the legs.

When this is done she pokes her head through the rent, at the same time pushing the skin backward. Now

she wriggles and tugs and pulls to free her four pairs of feet from their old coverings. Patiently she works away till the last foot is out. At the same time the covering of the abdomen has split along the sides; a few added jerks and twitches, and she is free from her old gown. But what a limp, helpless creature she is! Leaving her cast-off skin dangling above her, she drops a few inches farther and hangs there like a wet rag.

"And hangs there like a wet rag"

In a few minutes her legs begin to dry and strengthen a little; cautiously she moves them about, slowly draws them up to her, and straightens them out again. As you watch her you are surprised to see her whole body, legs and all, increasing a little in size. Now the new soft

covering begins to harden. Gradually it grows firmer and stronger. In less than an hour from the time the process began Mrs. Spinner is back in her web, proud, no doubt, of her bright new gown and her increased size. While the covering is soft the Spinners continue to grow, then stop until they moult again. Moulting takes place every week or two when the spiders are young. As they grow older the process is repeated less frequently, until the spider is full-grown, when she wears the same dress for the rest of her life.

Sometimes it happens that a Spinner loses a leg or a palp while moulting or by some other accident. But that does not mean that she must go limping for the rest of her life. Luckily for her another leg grows on, and by the time she has moulted once or twice it is as good as ever.

In order to grow, the Spinners must

have food and oxygen, just as you do. Now that you know something about their food, perhaps you would like to hear how they manage to get oxygen when they have no noses with which to breathe in air. In your body the air passes through your nostrils into a tube called the trachea, or wind-pipe, which leads to your lungs. In your lungs are hundreds and hundreds of air-sacs, the walls of which are penetrated by numerous small blood-vessels through which the blood is circulating all the time. When the air you have breathed in enters an air-sac, some of the oxygen from it goes through the thin walls into the blood. At the same time carbon dioxide and other waste products come out of the blood into the air-sac and are breathed out with the air through the nostrils.

Now, while the Spinner's breathing apparatus is not so complicated, it is

just as interesting. On the under side of the Spinner's body near the front of the abdomen, are two small, slit-like openings. Each slit opens into a small, sac-like cavity. In this space are a number of thin plates of membrane lying close together like the leaves of a book. These are the lungs, or the lung-books as they are usually called. Through the plates numerous blood-vessels ramify. When the air enters the lung cavity, the oxygen passes through the thin walls of the leaves, into the blood, and is carried all over the body.

There is a little spider that lives in the water, yet manages to breathe air, just as all her relatives do. She makes a unique little silk room like a bell. This bell rests in the water, mouth downward, and because it is filled with air no water can enter it. So the Spinner rests perfectly safe in

her house with its water floor. If her room needs a fresh supply of air she goes to the surface of the water, skilfully catches a bubble of air by protruding a part of her body above the water and quickly drawing it beneath again, — just as you may carry bubbles of air to the bottom of a glass of water by quickly pushing a leaf down through the water. Having caught the bubble she carries it down to her diving bell and lets it go. She does this again and again till she has her room filled with pure air which will supply her lung-books with oxygen for many days.

You must not imagine that the blood which carries the oxygen around through the Spinner's body is red and warm like yours. Instead, it is cold and almost colorless, resembling milky water. It is known as white blood. It is forced around through the body

by a long, tube-shaped heart, which is situated in the upper part of the abdomen.

The Spinner's digestive system is as simple as its heart, consisting chiefly of a stomach and intestine. The food, you remember, is reduced to a liquid state before it is taken into the mouth. So all that is necessary is to mix it with juices in the stomach, which makes it fit to be taken into the blood and carried to all the organs of the body.

All spiders are fond of water as well as of solid food. If you keep one in captivity a while you will see how eagerly she sucks up the water that you scatter in her cage. Out of doors you will find the spiders in the early morning drinking the drops of dew.

XXI

QUEER THINGS

PEOPLE have some odd notions about spiders. Some believe that these little creatures are always prowling about at night in order to try their poison-fangs upon any person whom they may find asleep. If, on awakening in the morning one of these persons finds a pimple on his face or hand he is sure to say: "See, a spider bit me here in the night."

"Always prowling about at night"

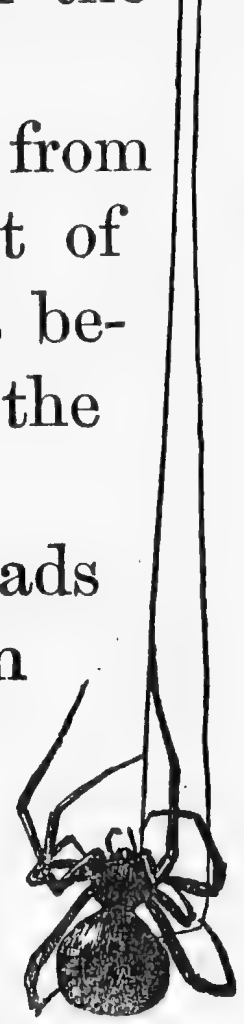
Now nothing could be farther from what a spider would do than this. Spiders do not like us well enough to come near us at any time. Indeed,

they fear us much more than we fear them, and will make a tremendous effort to get out of our way, if they accidentally enter the place where we are.

In some parts of Europe people believe the bite of a large spider causes the person bitten to fall in a fit. When one of these fits comes on, the friends of the afflicted person send for a musician, believing that nothing but the power of music will break the charm of the spider's bite.

If a spider drops by a thread from the ceiling and swings in front of you, according to some people's belief you are soon to become the possessor of a new dress.

If the air is full of the threads of flying spiders it is a sign that a storm will follow within twenty-four hours.



"If a spider drops by a thread from the ceiling"

Spinners and all their relatives are put together into one great class called Arachnida. We sometimes think of spiders as insects; they are not true insects, but Arachnids instead. We must look among the old Greeks myths to find the story which tells why spiders are called by such an odd name.

Among the ancient Greeks lived a beautiful maiden called Arachne. She was not only beautiful, but very skilful in weaving and spinning. Her work was so wonderful, that the nymphs as well as mortals gathered around her to watch the growth of the marvellous fabrics in her loom.

People began to say, "Arachne must have been taught by Minerva herself, the goddess of spinning; in no other way could she have gained such skill."

When Arachne heard this she was indignant, and declared that no one

had taught her, but that all she knew she had learned by herself.

"Let Minerva come and try her skill against mine if she chooses," she exclaimed in her enthusiasm.

Now Minerva, the great goddess, heard what the rash little maiden had said and was much displeased, and she believed that any mortal who would dare to challenge a goddess for a test of skill deserved severe punishment. She was willing, however, to give Arachne a chance to withdraw her challenge. Disguising herself as an old woman she called upon the little maid as she stood at her loom. In a kindly manner she praised Arachne's work, then advised her to try her skill with mortals as much as she pleased, but not to think of competing with a goddess.

Arachne, blinded by her conceit, told the old woman to mind her own

affairs. "Let Minerva come if she is not afraid to make the test," she said haughtily.

At this the old woman threw off her disguise, and Minerva stood revealed before the girl, and before all the nymphs and people who were accustomed to gather around Arachne.

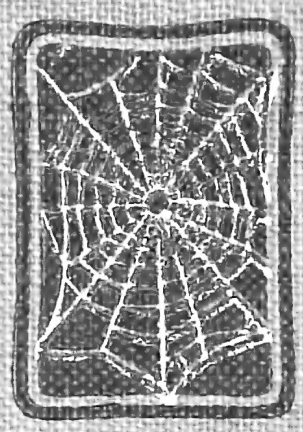
Even now the presumptuous maiden was not abashed. Soon the contest began.

As Minerva's shuttle flew back and forth she pictured in her web some of her greatest victories. Arachne foolishly showed in her web some of the shortcomings of the gods and goddesses.

Minerva looked upon the web of the maiden with admiration, yet so enraged was she at the insult to the immortals that she struck the fabric with her shuttle tearing it in two. At the same moment she gently touched Arachne.

At the touch of the goddess the maiden realized what a dreadful thing she had done. In her remorse she was about to hang herself. But Minerva cried: "No, you shall not die, but you shall hang by a thread and spin and weave all the rest of your life."

She touched her again and the rash little maiden was changed into a spider. So she spun and wove all her days, and ever since her numerous descendants have been doing the same thing, and because of her they are known everywhere as Arachnids.

LLOYD LIBRARY & MUSEUM
917 PLUM STREET
CINCINNATI, OHIO 45202 USA

QL
452
.2
.P38
1916